FORESTRY ABSTRACTS

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PRACTICAL FOREST GENETICS IN SWEDEN

SWEDISH research in forest genetics has achieved a considerable international reputation through the work in progress under the Forest Tree Breeding Association (*Föreningen för växtförädling av skogsträd*) at Ekebo and the various branch stations in different parts of the country. Less well known outside of Sweden is the work of the Society for Practical Forest Tree Breeding (*Sällskapet för praktisk skogsförädling*, at first known as *Sällskapet för skogsträdsförädlingens främjande*), which was formed in 1940–41—on a characteristically Swedish pattern—by a number of central- and north-Swedish forest industrial companies in conjunction with the Gävleborg County Forestry Board, and on the initiative of Dr. Bertil Lindquist, who has recently been appointed Professor of Silviculture in the State Forestry School after holding successive lecturerships there since 1931 in botany and silviculture, has made special studies of the variation in crown form and timber quality of Scots Pine in Sweden, and has acted as the scientific leader of the Society since its foundation. The Society's chief aim is to make early practical use of genetical knowledge and principles, and Lindquist has written a book[1] which is summarized in the following notes, and which, being intended to complement the adequately publicized pure research in forest genetics, intentionally disregards this aspect in favour of an examination of practical measures that can be applied at once, and the possible effects of a successful tree-breeding programme on future silvicultural methods and national economy.

From the start, Lindquist emphasizes the scantiness of rigorously established genetical facts on which a breeding programme might be based, but sees no reason why the strong probabilities offered by phenotypic variation should not be used at once, subject to constant control by progeny trials. Past breeders of both plants and animals have successfully used phenotypic quality as an index to genotypic quality, but it will appear in the following that although the same broad assumption is made with regard to the work begun or in prospect, it is nowhere assumed that a poor phenotype is necessarily of inferior genetic quality or a good phenotype superior genetically. The point of view is rather that, since detailed trials cannot be made of every parent tree available, attention will naturally be concentrated in the first place on trees of marked phenotypic superiority, growing in conditions which do not suggest that environment is responsible for that superiority. No such tree, however, would be accepted finally without adequate progeny trials.

In his second chapter, Lindquist argues that in the more thickly populated regions and those where timber cutting has long been a major industry, and especially in the case of Scots Pine and the types of Birch with figured wood, continued selective fellings have had a dysgenic effect: the most valuable timber trees have been felled, inferior ones left, and no attention has been paid to quality of seed-bearers, hence the progressive deterioration in genetic quality. The remedies, and the means of maintaining the highest possible genetic quality in Swedish forests, are considered in four chapters which form the major part of the book:—

(1) *Immediate measures*: (*a*) *Silvicultural operations*—Tending operations should remove coarse-branched or slow-growing trees and those showing poor natural pruning; in regeneration fellings the seedbearers left should be of high quality and rate of growth. There is a definite need for propaganda to drive home the idea of genetical selection in such operations. (*b*) *Seed harvesting and the seed trade*: The first requisite is nation-wide mapping of tree populations by trained persons; such a survey was begun for Scots Pine about four years ago, and preliminary maps have already been prepared for Norrland and northern Svealand. As a standard for appraisal was obviously essential,

[1] *Den skogliga rasforskningen och praktiken.* [Racial research in forestry from the practical point of view.] Svenska Skogsvårdsföreningens Förlag, Stockholm, 1946, pp. 176 [Sw.]—With numerous photographs, mainly of élite trees and stands.

use was made of a classification devised by the Royal Forestry Board and slightly modified in consultation with that body by the private breeding enterprises represented by the author. The main criterion is the frequency in a given population—and it should be remembered here that natural regeneration has been the general rule in Sweden—of markedly superior phenotypes, a high frequency holding out prospects of cheaper and more efficient seed collection, a greater chance of good parentage on the male side, and a greater chance of genetic stability in the superior trees. Stands have been been graded as: (i) '*Plus*' *stands*, in which fine-branched, narrow-crowned trees predominate. After removal of the few broad-crowned trees, crown density should be at least 0·6 and the residual stand will constitute what some have called a 'living seed store', furnishing *extra prime* seed. (ii) '*Normal*' *or* '*zero*' *stands*, in which after removal of the inferior trees a light shelterwood of narrow-crowned and intermediate trees should remain. For the time being the bulk of Pine seed requirements ought to be derived from such stands, cone picking to be done from felled trees, especially in the later cuttings, and seed to be graded as *prime* if taken only from the better trees, and as *standard* if no discrimination is exercised. (iii) '*Minus*' *stands*, in which removal of the inferior types would be practically a clear felling. These are usually near settlements and much seed must have been collected from them in the past, but the prevention of seed collection in such areas must be regarded as an essential step in the breeding programme. In the first three years of mapping, by the Society for Practical Forest Tree Breeding and its offshoot [1]*Gävleborg läns skogsträdsförädling*, of Scots Pine in Norrland and Dalecarlia, over 200 'plus' stands totalling some 400 ha. have been recorded, while the 'normal' areas appear to constitute about one-half of the forest area. In the county of Gävleborg it was expected that in the coming season about 100 kg. of seed would be got from 'plus' stands and 800-1,000 kg. of prime seed from fellings. This would be enough to cover all immediate local requirements. The case of Norway Spruce is rather simpler, as 'minus' areas are uncommon and 'plus' areas frequent, in some regions occupying greater areas than the 'normal' stands. Some form of official seed control is now an urgent need if the use of seed graded in this manner is to develop properly and trade abuses to be prevented. Lindquist suggests that the County Forestry Boards would be the fittest organizations for controlling collection and extraction. (*c*) *Possible increases of yield by cautious transfer of climatic races and by roguing of planting stock before it leaves the nursery*: Both of these methods appear to hold some promise, and the Society for Practical Forest Tree Breeding has trials in progress.

(2) *Longer-term measures:* As the long-term research on hybridization, 'chromosomal' breeding etc., is left aside, this chapter—which Lindquist clearly regards as the most essential in the book—is in reality a thorough discussion of artificial seed plantations, perhaps better called seed orchards, as a means of satisfying the expected very large demand for high-grade seed in Sweden. The idea of producing seed in special orchards has been repeatedly urged by Holger Jensen of Ramlösa Nurseries, who is collaborating with the Society and much of whose work has been devoted to showing that abundant, sustained, and early flowering can be induced by practices such as strangulation, bark ringing, root pruning and the use of grafts on slow-growing stocks, lines of work which are familiar from the pioneer work of C. Syrach Larsen in Denmark. It has been provisionally estimated that a total seed-orchard area of 1,200 ha. might be able to produce the whole annual requirement (about 60 tons) of conifer seed in Sweden, and for the hardwoods the area required would be much smaller, e.g. for Oak and Birch, areas of 15 ha. each could cover the whole requirement.

The seed orchards would be composed of élite seedling or grafted stock which would be ringed or strangulated to induce flowering. Jensen proposed that in view of the enormous number of grafts needed to establish such plantations, some should be raised from seed furnished by the earliest graftings, but Lindquist believes that it would be necessary to have many more grafted plantations

[1] The Society as a whole was not ready to engage straight away on Jensen's full programme of seed production in special orchards, but a number of members combined for this purpose under the name *Gävleborg läns skogsträdsförädling* [Gävleborg County Tree-Breeding]. These were the County Forestry Board of Gävleborg and the companies—Stora Kopparbergs Bergslags AB, Kopparfors AB, Bergvik and Ala Nya AB, Ljusne-Woxna AB, Iggesunds Bruk, Marma-Långrörs AB and Ströms Bruks AB—who have pressed on with the programme, and under the Gävleborg County Forestry Board have set up a grafting centre at Kratten. Graft plantations are planned on the lands of the member enterprises, and the propagation of élite material is proceeding at Ramlösa, where Holger Jensen is co-operating with the Society.

than envisaged by Jensen, even considering the increased costs and labour involved. Production of the grafted stock calls for skill and special knowledge, hence it would be best to concentrate this part of the work at a few central establishments. Facilities for the work exist at Ekebo and its branches at Brunnsberg and Sundmo, and at the Gävleborg County Forestry Board's station at Kratten. When in full production, these will be capable of producing about 30,000 grafts annually, which, especially in view of the present shortage of suitable scions, should suffice for the next five years. Lindquist considers that, if the scions used are derived from élite trees of the provenance zone concerned and of proven quality in progeny trials, seed orchards will represent a breeding method of far greater direct value than the controlled crossings hitherto produced in Swedish tree-breeding institutions. By bringing together 6–10 different élite strains for reciprocal fertilization, in a position relatively free from foreign pollen, the seed obtained should be of very high genetic quality.

Seed orchards could be established by County Forestry Boards, or even by individual forest owners, but it would be important to have the stock produced centrally under proper supervision; indeed, any seed orchard that produced seed or plants for sale ought to be inspected and approved by some State authority.

The orchards should be given the best possible site and tending: they should preferably be in a central position, near to some reasonable means of communication, on level, open ground of good quality, isolated so far as possible from pollen of the same species, and in the most favourable climatic conditions possible within the particular provenance zone, in order to obtain a good seed set. Maps are given to show provenance zones, the limits of which were decided with the collaboration of Eneroth, Langlet and Jensen, for Scots Pine and Norway Spruce; for Oak, Beech and Birch, approximately the same divisions might be made as for the latter species.

In sum, the advantages of seed orchards would be: (*a*) Concentration of seed production on areas convenient for management, with considerable savings of time and money. (*b*) A probability of higher viability and vitality as a result of favourable climatic conditions for seed setting. (*c*) The readiness with which fertilizer treatments could be applied, if necessary. (*d*) Increased possibilities of controlling seed pests by spraying. (*e*) Continuity of production achieved by induced flowering, giving abundant seed crops at least every other year and thus simplifying the planning of artificial regeneration projects and largely eliminating seed storage for any considerable period.

The long-term nature of these proposals emphasizes the need for making a start. In the case of the conifers it is estimated that some 15 years must elapse before seed orchards can be established on any large scale, and a further 10 years before they come into full bearing. For the hardwoods the whole period could possibly be reduced to about 10–12 years.

(3) *The mother trees of the élite seed orchards:* Considering that the quality of Swedish timber will determine its ability to compete in world markets, Lindquist urges the necessity for equal attention to quality and rate of growth in breeding. An essential part of the work of the Society for Practical Forest Tree Breeding and *Gävleborg läns skogsträdsförädling* is the organization of detailed inventories of élite trees over the whole country, as it is among these that the material for longer-term breeding will be sought. The object is to bring a fairly large number of élites into propagation as soon as possible, with subsequent elimination of types which prove unsuitable in progeny trials, so that the programme shall not be paralysed by the time factor. An élite tree must be an extreme 'plus-variant' for its kind in both quality and rate of growth. The qualifications for élite status are discussed in detail for all the common Swedish species, and those for Scots Pine are taken in the following as an example.

A Scots Pine élite tree must show marked superiority in both height and diameter growth over neighbouring comparable trees; in practice it is required to have a volume at least 50 per cent. greater than the average of the three next largest stems in the immediate vicinity. The standard here set is considered largely to dispose of the possibility that the superiority of an élite over its neighbours could be a result of very localized variations in the environment. An élite tree must have a fine-branched crown, and this factor is balanced against rate of growth in the sense that élites are selected only among the narrow-crowned type, but extremely fine-branched crowns are rejected unless they belong to the absolute dominants in the stand. No great attention has so far been paid to natural

pruning of the bole, though trees with coarse branches on the bole, or those with a disproportionately long green crown, have been rejected. The upper crown is taken as a good index to quality, on the assumption that, so far as the absolute dominants are concerned, there is a reasonable degree of uniformity in its environment, and a good upper crown with fine, regular branching probably indicates a good genotype. There is little evidence that heartwood formation is subject to genetic variation, but it has been thought prudent to reject trees poor in this respect. Finally, and especially as the narrow-crowned Pines are on the whole less abundant seed-yielders than the broad-crowned, it is very important not to select against fertility, and an élite must set seed regularly and abundantly.

In the inventories under the author's guidance, about 3,000 élite Scots Pines have been registered, seed has been collected, and after about 2–3 years of progeny trials some 10 per cent. of the trees have been selected for further detailed examination, while about 100 trees have given such excellent seedlings, and have themselves shown such striking growth that they have been taken up for grafting and mass propagation.

Among the remaining species discussed, Birch (mainly *Betula verrucosa*) presents special complications owing to the necessity of distinguishing and assessing the timber quality of at least three kinds of figured wood and two of plain wood. A good deal of space is given up to the (rather unreliable) external features, wood characters, distribution and qualifications for élite status, in the various forms. Further, as triploid hybrids of *B. pubescens* × *verrucosa* are largely sterile, élite material will have to undergo cytological examination and viability and survival tests.

The progeny trials to which élite trees will be subjected are severe. They must last at least 30–40 years, must be replicated on plots sufficiently large (not less than $\frac{1}{4}$ ha.) to give reliable indications of yield by area, and must take account of habit, rate of growth, timber characters, hardiness, etc. Since such detailed trials cannot be made for all the élites recorded, trees whose progeny soon shows undesirable characters are rejected at an early stage. In the preliminary grading of élite trees as parents for such seed orchards, the choice falls among rapid growing trees whose offspring have shown particularly good growth in the nursery and which have given scions of exceptional growth in comparative grafting trials.

A final note on the maintenance of élite trees and 'plus' stands for future propagation emphasizes that their quality renders them specially liable to exploitation, and steps must often be taken to ensure that they are not prematurely felled. The Society for Practical Forest Tree Breeding and *Gävleborg läns skogsträdsförädling* have bought up particularly valuable élite trees and the right to pick cones in élite stands. Once a tree has been successfully propagated by grafting, the risk of losing a good genotype largely disappears, and Lindquist suggests that a permanent State arboretum should be formed of grafts of all the most valuable élite trees in Sweden. As the breeding programmes get under way, it may also be necessary to provide for possible switches in future requirements by protecting certain areas as reserves of genetic variation, where the original populations would be allowed to continue without selection.

(4) *Present employment of the élite material:* Under existing conditions economy must be exercised in the use of élite seed, and direct sowing will be out of the question for the present. Until the élite material becomes abundant and cheap, plantations will no doubt be confined to the best sites as regards both quality class and facilities for extraction; but later, when costs fall, the emphasis will presumably change to the use on the poorer sites of material which will give an increased value yield and possibly even enable improvements to be undertaken. The principle of the right species in the right habitat is obviously more important than ever when élite stock is being used.

Most of the remainder of the work is devoted to an attempt at assessing in broad terms the influence of the breeding programme on forest practice in Sweden, with chief reference to tending operations in existing forests, the use of high-quality seedbearers for natural regeneration, a consideration of the improvements to be expected from the current use of high-grade seed and the future use of top-grade seed from the special orchards, and the question of silvicultural costs. As regards the last-named it is suggested that the new selections will enable wider spacings[1] to be used, will give less

[1] In another connexion, the possibility is noted of using denser stands of the narrow-crowned types of Scots Pine: many reports suggest that 'plus' stands of this species carry a high stocking for their quality class as assessed from individual increment, and have a strikingly high volume yield per unit area. The matter requires proper investigation.

risk of failure, more continuous growth during the period of closure (and therefore less costly cleanings), and entail less selection during thinnings. These benefits would be most marked in the case of Scots Pine.

Seed and plant costs for material derived from 'plus' stands are bound to be rather high at first, though Lindquist believes on the basis of some provisional estimates that they will be far from prohibitive, especially considering the expected gains in quality and growth. Collection of seed from individual élite trees is naturally undertaken mainly for scientific purposes, though in particularly favourable circumstances, or with an abundant seeder such as Birch, it could pay its way. Jensen's tentative calculations of the cost of seed produced in the future élite seed orchards is also reproduced. Policy is to keep the prices of high-grade seed as low as possible in the national interest, and if the County Forestry Boards become the main producers of seed, this should be possible. When the seed orchards are in full production, conifer seed should become cheap enough for use in direct sowings, and élite seed of Birch and Oak might be even cheaper than the ordinary seed at present on the market.

The two brief concluding chapters contain speculations on the national consequences of using high-quality, high-yielding stock and an outline of the organizations in Sweden now interested in tree breeding.

P. G. B.

ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another or the same language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages.

The term "billion" used in papers originating in North America means a thousand million.

0. GENERAL FORESTRY

01. BIBLIOGRAPHY

[2214]. 01.3 (54). **Classification of silvicultural ledger files. (Sixth revision).** *Indian For. Leafl.* (*Silviculture*) No. 94, 1946. pp. 36.

02. DICTIONARIES

[2215]. 02.4. **English-German dictionary of forest-tree names, with special reference to temperate zones in Europe and North America, including scientific (Latin) names of tree species.** International Forestry Centre, International Institute of Agriculture, Salzburg. Preliminary edition (to be revised), 1946. pp. 13 + 6 + 6.

The main part of this glossary consists of the scientific names of 330 genera and species with their German and English (or American) equivalents, arranged alphabetically. This is followed by alphabetical lists of English and German names, with cross references to the main list. This is described as a preliminary edition (to be revised), and it appears to be a first, rough draft.

05. PERIODICALS

05.3. *Annual Reports*

[2216]. 05.3 (410). GREAT BRITAIN. **Twenty-sixth annual report of the Forestry Commissioners for the year ending September 30th, 1945.** H.M. Stationery Office, London. 1946. pp. 52.

[2217]. 05.3 (54.7). SIND. **Annual administration report of the Sind Forest Department for the year 1944–45.** Govt. Press, Karachi. 1946. pp. viii + 25.

[2218]. 05.3 (66.7). GOLD COAST. **Report on the Forestry Department for the year 1945–46.** Govt. Printing Department, Accra. 1946. pp. 8.

[2219]. 05.3 (68.9). NORTHERN RHODESIA. **Department of Agriculture: annual report for the year 1945.** Govt. Printer, Lusaka. 1946. pp. 28.

[2220]. 05.3 (69). MAURITIUS. **Annual report of the Forest Department, 1945.** Govt. Printer, Port Louis. 1946. pp. 13.

[2221]. 05.3 (71). CANADA. **Twenty-ninth annual report of the National Research Council of Canada, 1945–46.** Ottawa, Canada. 1946. pp. 65. *N.R.C.* No. 1411.

[2222]. 05.3 (729.2). JAMAICA. **Annual report: Forest Department, for the year ended 31st March, 1946.** Forest Department, Jamaica. 1946. pp. 8 + [2].

[2223]. 05.3 (729.8) : 4. BERMUDA. **Report of the Plant Pathologist for the year 1945.** Department of Agriculture, Bermuda. 1946. pp. 12.

[2224]. 05.3 (73) : 4. **Report of the Chief of the Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, 1945.** U.S. Govt. Printing Office. 1946. pp. 63.

[2225]. 05.3 (74.6) : 45.3. CONNECTICUT. **Connecticut State Entomologist: forty-third report, 1943.** *Bull. Conn. agric. Exp. Sta.* No. 481, 1944. pp. 324.

[2226]. 05.3 (76.4 : 78.9 : 79.1). **Annual report of the Southwestern Forest and Range Experiment Station: calendar year 1945.** U.S. Forest Service. 1946. pp. 33.

[2227]. 05.3 (77.4 : 77.5 : 77.6). **Annual report: Lake States Forest Experiment Station, 1945.** U.S. Forest Service. 1946. pp. 20.

[2228]. 05.3 (946). TASMANIA. **Report of the Forestry Department for the year ended 30th June, 1946.** Govt. Printer, Hobart. 1946. pp. 12.

[2229]. 05.3 (96.1–8). FIJI. **Forest Department: annual report for 1945.** *Council Paper* No. 15, 1946. pp. 4.

06. CONFERENCES. SOCIETIES. ASSOCIATIONS. EXHIBITIONS. EXCURSIONS

[2230]. 06. GOLAY, G. Les origines, les buts, et les formes de la collaboration internationale en matière forestière. [**Origins, aims and forms of international collaboration in forestry.**] *Intersylva* 2 (3), 1942 (376–87). [F.g.e.span.it.]

Mainly an account of the organization and activities of the Centre International de Sylviculture.

[2231]. 06.3 (44) : 07.2 : 90. L'exposition du bois. [**The Wood Exhibition.**] *Rev. int. Bois* 31 (112), 1946 (153–5). [F.]

Some account of the international timber exhibition opened in Paris in September 1946, together with a review of the present state of, and future plans for, forestry in France, the provision of training facilities and the research institutes.

[2232]. 06.4 (43.1–5) : 60.3 : 12.26–8 : 94.3 : 22.2 : 34.24 : 22.6. Voyage d'étude en Hesse du Centre international de Sylviculture. [**C.I.S. expedition in Hesse.**] *Intersylva* 2 (3), 1942 (449–55). [F.]

There were 3 main objects of study on this expedition, which is described in some detail: (1) the exploitation of Beech on basalt, on primitive rocks in the mountains, and on waterside sites; (2) conditions of ownership and economic management of small private forests; (3) exploitation of coppice for tanbark with conversion to mixed high forest.

07. EDUCATION AND RESEARCH. TOOLS, IMPLEMENTS

See also *For. Abstr.* 8 (No. 2831).

[2233]. 07.1 (43.1–5) : 81. ORTH, K. L'instruction des agents du service forestier dans le Reich allemand. [**Professional training for the forest service in the German Reich.**] *Intersylva* 2 (2), 1942 (330–40). [F.g.e.it.span.]

[2234]. 07.1 (71). FENSOM, K. G. **Proposed Canadian forest education study.** *For. Chron.* 22 (4), 1946 (267–73).

Part of a report of the Forest Education Committee of the Canadian Society of Forest Engineers to be presented at the annual meeting of the Society in Feb. 1947. Recommendations are made for the setting up of a special investigation into the present state of Canadian forest education and desirable changes in it. Special importance is attached to the question at what stage and to what extent should specialization begin.

[2235]. 07.1 (71.1). LIERSCH, J. E. **Forestry education in British Columbia.** *For. Chron.* 22 (4), 1946 (253–60). [Univ. of British Columbia, Vancouver, B.C.]

[2236]. 07.1 (71.3). COSENS, G. G. **Forestry education in the University of Toronto.** *For. Chron.* 22 (4), 1946 (250–2).

[2237]. 07.1 (71.5). GIBSON, J. M. **Education in forestry.** *For. Chron.* 22 (4), 1946 (238–45). [Univ. of New Brunswick, Fredericton, N.B.]

A short account of the forestry education given at the University of New Brunswick.

[2238]. 07.2 (52). HUBERMAN, M. A. **Forest research in Japan.** *J. For.* 45 (2), 1947 (85–8).

Between 400 and 500 men and women are engaged in forestry research in Japan at the present time. Of these, 200 are employed by the Bureau of Forestry and 75 each by the Imperial Bureau of Forests and Estates, by the Hokkaido Station, and by the 7 prefectural stations combined. There appears to be much overlapping in the programmes of the several agencies. A list is given of current studies in each field of research at the several stations. The great weaknesses of most of this research

are that it is pursued in too exclusively academic a manner and that there is a lack of appreciation of the importance of methods of statistical analysis, and even of the need for basing averages on adequate samples.

[2239]. 07.2 (73) : 2. BARRETT, L. I. **The status of silvicultural research.** *J. For.* 44 (11), 1946 (972–7). [Division of Forest Management Research, U.S. Forest Service.]

An outline of the progress made to date in silvicultural research in the United States, with some indication of the directions in which further research is urgently needed.

[2240]. 07.6 (489) : 07.2. BORNEBUSCH, C. H. Oversigt over det forstlige forsøgsvæsens prøveflader og kulturforsøg, 1.del, Nordsjælland og Bornholm. [**Conspectus of the sample plots and plantation trials of the Danish Forestry Research Organization. Pt. I. N. Sjælland and Bornholm.**] *Forstl. Forsøgsv. Danm.* 20 (1), 1946 (1–84). [Dan.]

A comprehensive handlist, with maps, brief descriptions of the plots and the objects of the trials, and tables of results to date. Two more parts are to follow at yearly intervals, one dealing with the remainder of the Danish Islands, the other with Jutland.

[2241]. 07.6 (79.1) : 2 : 12.25. PEARSON, G. A. **A plea for applied silviculture in forest research.** With comments by T. T. Munger. *J. For.* 44 (11), 1946 (958–62).

The writer criticizes the forest experiment stations in the Western United States for their general failure to demonstrate in experimental forests the principles of management which they have established as a result of intensive research, and illustrates his theme by an account of what has been accomplished in the management of Fort Valley Experimental Forest.

[2242]. 07.6 (79.4) : 65.7. BARR, P. M. **The research programme of Blodgett Forest of the University of California.** *J. For.* 44 (10), 1946 (738–41).

The objectives of management and research on a 2,731-acre, second-growth forest belonging to the University of California are presented as an example of the function and opportunities of experimental forests. The basis of the research programme was originally defined as the provision of answers to the following questions: (1) How may the quality or density of stocking on a tract of cut-over land be measured quantitatively, and what constitutes full or reasonably satisfactory stocking? (2) Is there a tendency for an understocked stand to progress towards full stocking; and how may the rate of progress be measured? (3) Where understocking exists, what cultural measures are desirable or practicable in order to improve the existing stand density? The Faculty of Forestry of the University also defined four elements of administrative policy which subsequent experience has proved to be basically sound. (1) The primary use of the forest should be to furnish facilities for research. (2) The forest should not be used for undergraduate instruction. (3) The forest might be used for graduate instruction and research as opportunity occurred. (4) The division should not propose to set up demonstrations of forest treatment which might not be in keeping with the practical needs and limitations of the area, but should attempt to apply such improved practices as might be appropriate to local conditions.

[2243]. 07.7 : 32.3 : 24.26 : 38 (73 : 489). JØRGENSEN, O. M. Mekanisering i Nordamerikansk Skovbrug. [**Mechanization in North American forestry.**] *Dansk Skovforen. Tidsskr.* 32 (1), 1947 (1–45). [Dan.]

An illustrated account of mechanical equipment and some tools seen in North America by the author on a tour in 1946, with particular reference to various types of power saws (including a list of models and manufacturers) and their performance, the 'Peppy' barking machine, tractors for extraction, the 'Bouffard Loader', nursery equipment (with special mention of flamethrowers for weeding, a combined tractor cultivator and row weeder, root-pruning implements and plant packers), and the use of the bulldozer in roadbuilding and other improvement work.

There is a great need for research on mechanical equipment suited to Danish conditions and for the progressive introduction of practical mechanical aids. The greatest obstacle in Denmark would certainly be the difficulty of providing financial means at the outset, but it is possible that co-operative ownership of equipment or use of multi-purpose equipment might do something to smooth the way in this respect.

09.4. *Forest Statistics*

See also *For. Abstr.* 8 (Nos. 2678–81, 2684–5).

[2244]. 09.4 (47.1). FINLAND. Kertomus Metsähallinnon toiminnasta vv. 1939–43. [**Report on the work of the Forest Administration, 1939–43.**] *Suomen Virallinen Tilasto, Helsinki*: XVII *Metsätilasto*, No. 38, 1946. pp. 98. [Fi.Sw.f.]

[2245]. 09.4 (489). Hugsten i Skove og Plantager 1944–45. [**Fellings in the forests and plantations [of Denmark], 1944–45.**] *Dansk Skovforen. Tidsskr.* 31 (11), 1946 (530–4). [Dan.]

[2246]. 09.4 (71) : 35 : 33.1. **Estimate of forest production: operations in the woods in Canada, 1944.** Dominion Bureau of Statistics, Department of Trade and Commerce, Canada. 1946. pp. 14. [E.F.]

The estimated or reported total production, consumption, exports and imports of each of the principal wood products for 1944 are tabulated, with equivalents in volume of standing timber and value. The total volume and value of production by provinces and by categories are given for each of the years 1926–44 inclusive. The last of the 4 tables shows depletion of Canadian forest resources for each of the years 1926–44, distinguishing depletion due to fire, insects and fungi, utilization, percentage of depletion due to waste and that due to utilization. In 1944, total volume of depletion was 3,335,676 cu. ft., of which 2,508,046 thousand cu. ft. were utilized, 327,630 thousand cu. ft. destroyed by fire, and about 500,000 thousand cu. ft. destroyed by insects and fungi, the percentages of utilization and loss being 75·2 and 24·8 respectively.

[2247]. 09.4 (73) : 09.7 : 33.1 : 35 : 9. WOODS, J. B. **Report of the forest resource appraisal.** *Amer. For.* 52 (9), 1946 (414–28).

The American Forestry Association has been carrying out a nation-wide forest resource appraisal at the same time as the Forest Service was conducting a national forest survey which is still in progress. Many of the figures in this report are based on Forest Service findings. It is stated that commercial forests are growing, or could be grown, upon 465,094,000 acres in the United States, or about one-quarter of its land area. There is tree growth on 656,374,000 acres, the difference being accounted for by state and national parks, large, open woods in the south-west, alpine and other non-commercial stands. Of the commercial forest area 19 per cent. is in federal ownership or control; states, counties and municipalities hold 6 per cent.; farm woodlands amount to 30 per cent. and industrial and other ownerships total 45 per cent. There is standing upon this commercial forest area 1,620,824 million bd. ft. of sawtimber, of which 80 per cent. is softwoods. Seventy-two per cent. of all sawtimber is situated west of the Mississippi River upon 35 per cent. of the commercial forest land. On the other hand, 70 per cent. of the young timber volume is situated in the east on once cut-over land.

The total sawtimber volume appears to compare favourably with the most recent previous estimate (1938) of 1,763,657 million bd ft., for about 330 billion bd. ft. of sawtimber have been removed from the forests in addition to 30–35 billion ft. lost by fire, wind, insects and disease. The difference, however, is greater than it seems, for standards of classifying timber as big enough for commercial milling are being steadily lowered, and it is also probable that estimates made in 1938 were far below actual volumes present in a number of states. Total annual drain (including losses) is estimated at 53·9 billion bd. ft. of sawtimber and 40,609,182 cords of pole timber. The forests, as they are managed to-day, put on an estimated annual increment of 36 billion bd. ft. of sawtimber and 66 million cords of wood of pole size. Usually this annual increment is greatest where cutting is heaviest. The northern regions contribute nearly 24 per cent. of total sawtimber growth on 27 per cent. of total forest area and 14½ per cent. of total sawtimber volume. The south, with 40 per cent. of the forest area and 21 per cent. of volume, contributes 55 per cent. of increment. The western regions possess nearly 65·5 per cent. of the nation's sawtimber, upon 23 per cent. of the forest area, and contribute less than 20 per cent. of the total annual increment. While, for the country as a whole, annual growth of wood of less than sawtimber size appears to be considerably in excess of drain, there is overcutting in certain districts. The excess of sawtimber drain over growth for the whole country amounts to a ratio of 3 : 2. A number of tables are included

in the report which give land area by major use classes, forest land area by broad classes, ownership of commercial forest land, sawtimber stand volumes, sawtimber ownership, condition of commercial forest stocking, all by regions; area of commercial forest and sawtimber stands by states; summaries, by species, of eastern and western softwoods and hardwoods.

09.7. *Monographs of Individual Forest Regions*

See also *For. Abstr.* 8 (Nos. 2827–32, 2853).

[2248]. 09.7 (410) : 90. Rowe, W. H. **Our forests.** Faber and Faber Limited, 24 Russell Square, London. 1947. pp. 173 + plates. Price 12*s.* 6*d.*

To instruct the uninformed of the significance of forests and the purpose of forestry in relation to the lives of common folk, and to increase true forest-mindedness in Great Britain, this book develops its theme from two aspects—the romantic and aesthetic features of forests on the one hand, and the principles and practical methods of the science on the other hand.

Chapters entitled 'The magic of the forest', 'A glimpse into the past' and 'To-day and To-morrow' cover the romance and history of British forests up to the time of the Forestry Commission and the 1943 post-war forest policy. After contrasting common types of neglected or ill-managed woods with the form of the ideal forest crop, the author describes systems of management, nursery work, choice of species, planting out, tending, thinning, harvesting, etc. mainly for the instruction of the private owner. He emphasizes that no national programme of afforestation can be useful if it fails to deal satisfactorily with the great majority of woodlands—those under private ownership.

Three chapters are devoted to the characteristics and requirements of species and to the uses of their timber. Financial considerations are analysed in order to answer the questions 'Can existing woodlands yield an annual excess of income over expenditure?' and 'Is it profitable to invest money in improvement or planting?' The explanations of death duties, income tax, and dedication help to show where money spent on woodlands can be a reasonable advantageous long-term investment.

The illustrations are 33 half-tone plates of good quality.

[2249]. 09.7 (43.1–5) : 90. Poole, A. L. **The forests of the British Occupation zone of Germany.** *Emp. For. Rev.* 25 (1), 1946 (25–31 + plates + map). [New Zealand Department of Scientific and Industrial Research.]

The writer gives a brief account of the forests, distribution of species, and silvicultural systems of the British occupation zone of Germany, and stresses the close integration of forestry and wood-using industries in the past. The Nazis introduced a simple method of allocating and obtaining an over-all yield from the forests. The forestry year runs from 1st October to 31st September. Some time before 1st October, all forest owners had to submit a return showing the quantity and types of timber which they proposed to cut during the ensuing year. This quantity was based upon the estimated annual yield, and the regulation of wood prices eliminated any temptation to overfell in times of higher prices. For State Forests, the amount of the cut was estimated from the working plans, which are based on the principle of sustained yield. The figures thus obtained were collated by the central forest authority, the Reichsforstamt, and were then adjusted to the over-all national needs for wood. The adjusted figure was then again split up and issued to individual forests as the felling target for the year. About two-thirds of the felling was done during the winter and one-third in the summer. Timber was barked and left to lie in the forest for some time for partial seasoning. It is emphasized that, in a closely integrated system such as this, the overcutting which will take place during the next few years as a result of the need to make good war damage and pay reparations and of the unfortunate demarcation of the British zone (7·3 ha. per 100 of population as compared with 17 ha. per 100 for the whole country), will have serious repercussions on the whole future of German forestry. It is believed, however, that the basic structure of the German system is so well established that, provided overcutting is carried out according to plan, no permanent disablement of the forest economy should occur, if the German foresters and research staffs are left intact to devise remedial measures.

[2250]. 09.7 (43.1–5) : 98.1 : 21.0 : 45.3. Noskowiak, A. F. **Notes on Bavarian forests and present timber requirements.** *J. For.* 45 (2), 1947 (124–5).

The field experiment stations maintained by the Bavarian Forest Administration are still carrying on research, though on a much reduced scale. Some notes are given on the Grafrath experiments with exotics which have been in progress since 1870. *Abies grandis* is the most promising of the conifers. Douglas Fir does very well and has good form, but is subject to attack by several fungus diseases. There is much concern over an extensive infestation of *Ips typographus* and *Pityogenes chalcographus*. The usual method of control is to fell trap trees in a healthy or infested stand. When the first eggs and larvae appear, the bark is peeled off and the resulting exposure kills them.

[2251]. 09.7 (43.6). GLOVER, SIR H. **The forests of the British zone of Austria.** *Emp. For. Rev.* 25 (2), 1946 (188–96 + plates).

Notes by the Forest Adviser to the Allied Control Commission for Austria, on the forests and forest practice in the British zone (Styria and Carinthia). The subjects dealt with include climate, area, agriculture, history, ownership, systems of management, rights of user, transport, pulp and paper mills, firewood, yield.

[2252]. 09.7 (47.2) : 32. SHINEV, I. S. Lesa evropeyskogo severa kak ob-ekt mekhanizirovannoy lesoeksploatatsii. [**The forests of northern European Russia and their suitability for mechanized logging.**] *Lesnaya Prom.* No. 10/12, 1945 (8–10). [Russ.]

The total area under forest in Archangel and Vologda Oblasti and Komi Republic is about 52 million ha. (Pine and Spruce occupy 91 per cent. by area), with growing stock in mature and nearly mature trees of about 4 milliard cu.m. This represents 41 per cent. by area, or 38 by volume, of all the forests of European Russia. Of the above area, 43 million ha. are State production reserves carrying 3·4 milliard cu.m. of mature and almost mature timber. The composition by age groups is: mature and overmature 71, nearly mature 17, middle-aged 8, and young, 4 per cent. These forests are favourably situated for supplying the European part of Russia and the export market. A brief account is given of an investigation of the forests under the control of the big 'logging trusts' in Archangel and Vologda Oblasti, from which it is concluded that 60·7 per cent. by area or 69·2 by volume are suitable (as regards age, density of stocking and situation with respect to main transport communications) for mechanized logging operations.

The mean growing stock per ha. of such areas is 130 cu.m., and 93·4 per cent. of them have more than 90 cu.m. per ha. The compactness of these forests and their relatively close proximity to main rail- and waterways means that capital expenditure on transport would be proportionally low.

[2253]. 09.7 (485) : 9. **Scandinavian forestry. I. A flying visit to Sweden, by H. G. Champion. II. Notes on Swedish forestry, by R. W. V. Palmer.** *Emp. For. Rev.* 25 (2), 1946 (172–9 + plates).

Professor Champion gives an outline of the forest situation in Sweden, as observed in a short visit. Mr. Palmer gives rather more detailed notes on the general organization of forestry and the forest industry and the principal problems with which it is faced.

[2254]. 09.7 (62.4) : 3. NEILSON, J. R. **Forestry in the Sudan.** *J. Oxf. Univ. For. Soc.* (*3rd Ser.*) No. 1, 1946 (21–4).

A brief account of the forestry organization and the system of exploitation practised in the Sudan. In the Blue Nile region, clear felling followed by natural regeneration is the usual practice, blanks being filled by sowing. Temporary sawmills are set up in the area to be cleared, and produce mainly railway sleepers and timber from *Acacia arabica*. The forests of the White Nile area provide firewood for the river steamers. A worked area is regenerated by coppice of *A. seyal*, *Balanites aegyptiaca*, and *Zizyphus* spp. The gallery forests of the south have not yet been much exploited, owing to their inaccessibility. The more valuable species in this area are *Khaya grandifoliola*, *Chlorophora excelsa*, *Albizzia* spp. and *Erythrophleum guineense*.

[2255]. 09.7 (68.1). MILLER, O. B. **Southern Kalahari.** *Emp. For. Rev.* 25 (2), 1946 (225–9 + plate).

Notes on a journey from Kanye to Kokong via Khakea, through that part of the Kalahari sand sheet which has not been invaded by the more diverse woody flora to the east and north. Subjects dealt with are climate, rainfall, geology, vegetation, and the degradation of the Kalahari. The larger trees belong to only 4 species, *Acacia giraffae*, *A. gillettiae*, *A. detinens*

and *Boscia albitrunca*. *A. giraffae* (Camel Thorn) is the largest of these, up to 2 ft. d.b.h. and a total height of 30 ft., well distributed over the whole area. Large areas are treeless and from savanna woodland have become grass steppe which is very vulnerable to wind erosion. It is uncertain whether the small number of woody plants is to be ascribed to the comparatively recent stabilization of the sand sheet or to the greater aridity and lower temperature (compared with the country to the east and north) which would admit only drought and frost-hardy plants as colonizers, or to a combination of these two factors.

[2256]. 09.7 (729.2) : 09.4 : 12.19 : 23 : 3 : 9. SWABEY, C. **Forestry in Jamaica.** *For. Bull. For. Dep. Jamaica* No. 1, 1945. pp. 44 + map.

The bulletin attempts to present the basic data on which sound forest management in Jamaica should be founded. After a general description of the country, there are sections on the extent, distribution and types of forest, forest utilization, silviculture and forest policy; and a bibliography of 74 references.

[2257]. 09.7 (81) : 33 : 34. **Agricultural, pastoral and forest industries in Brazil.** United States Tariff Commission, Washington, D.C. 1946. pp. 78.

[2258]. 09.7 (95). SPARHAWK, W. N. **Notes on forests of Dutch New Guinea.** [Typescript.] 1942. pp. 22. [U.S. Forest Service.]

The total forest area of Dutch New Guinea is estimated at between 65 and 70 million acres. In 1942, the timber from these forests had apparently never been exploited commercially and had been utilized only to a very limited extent by the local population. The author reviews accounts of the vegetation by Beccari, Gibbs, Wichmann, Lane-Poole and others. Notes are given on 72 trees and woods that have been reported from Dutch New Guinea, based mainly on descriptions of the same or similar species in British New Guinea, including Papua, and in the Philippines. Weights and strength properties, where given, are derived from tests with a few samples only.

1. FUNDAMENTAL NATURAL LAWS OF THE FOREST

11.2. *Climate and Microclimate*

See also *For. Abstr.* 8 (Nos. 2262, 2351, 2361, 2695).

[2259]. 11.22 : 91.3. BRUNT, D. **Some factors in micro-climatology.** *Quart. J. R. met. Soc.* 72 (312/3), 1946 (185–8).

The factors of microclimate in forest with thick canopy are discussed. By day, solar radiation is largely absorbed in the uppermost layer of the canopy and below this is an inversion reaching to the ground. By night, with clear sky, the top of the canopy cools by radiation to the sky, the air cooled by contact with the cold foliage sinks to the ground, and there is a tendency for an inversion to form on the ground, reaching nearly to the top of the canopy, above which will usually be found the normal lapse-rate. Air temperature at the ground is at all times of day lower than the air temperature above the crowns. Relative humidity is always lower at the top of the canopy than at the ground. Horizontal penetration of wind into thick woods is slight but vertical penetration may be appreciable, though strong gusts of wind above the canopy are represented at the ground by very slight motion. When sunlight can penetrate the canopy, the distribution of temperature by day and night is intermediate between that in the dense forest and in the open. Wind will be appreciable and in the same direction as above the trees. In a clearing in dense forest the daytime temperatures will be high, often exceeding those in the open; clear nights will yield temperatures about the same as those in the open.

11.4. Soil

See also *For. Abstr.* 8 (Nos. 2366–7).

[2260]. 11.4 : 11.62.1. LUTZ, H. J., and CHANDLER, R. F. **Forest soils.** John Wiley & Sons, Inc. 1946. pp. xi + 514. Price $5.25. [Yale Univ., Cornell Univ.]

Convinced that most standard text-books on soil science are unsuitable for the use of forestry students, the authors have made the fundamentals of the science their basis and have developed its practical application to forestry

in the U.S.A., treating the main text so as to provide abundant references to reports of important research. Sections of this bibliography, which includes many citations from foreign literature, are appended to 13 chapters, each of which is a documented interpretation or review of original sources, rather than a generalized dogmatic narrative.

Chief subjects are soil-forming minerals and rocks, their disintegration and decomposition; the organisms and organic matter of forest soils; soil colloids; the physical and chemical properties and water relations of forest soils; soil formation; forest soil classification; soil erosion and forest soil deterioration.

The practical applications of the science to forestry are discussed in problems such as the improvement of humus conditions; the ecological significance of volume weight, pore volume, air capacity, aeration, temperature, moisture and acidity of forest soils; the fertilization of woodland and nursery soils; maintenance of soil fertility, and soil classification with respect to reforestation; deterioration resulting from pure stands and clear felling; measures for the control of erosion are fully covered.

There are 52 figures, and indexes for scientific and common names of trees, authors and subjects.

[2261]. 11.4 : 12.19 (44). DUCHAUFOUR, P. Le sol et la flore forestière en quelques points des secteurs parisien et ligérien. **[The soil and the forest flora at some points in the Parisian and Ligerian regions.]** *Rev. Eaux For.* 84; 85 (12; 1), 1946; 1947 (701–22; 16–38). [F.]

The primary question investigated by the author in this article is the progressive degradation of the forest on leached soils in an Atlantic climate, and how far this is an unavoidable phenomenon on certain soils. The study is based on 85 surveys of soil and flora at Fontainebleau, Sologne, Blésois, the Forests of Orleans, Thou-en-Puisaye, Montargis, and Harcourt (Eure). In all these areas, except Harcourt, the leaching of the soils is slightly slowed up by the dryness and strong sunlight of the summers and is therefore not quite as pronounced as in regions with a more oceanic climate. The soils are classified for convenience into 5 series, according to the nature of the subsoil: *Series* 1, compact clays; *Series* 2, silts or sandy clays; *Series* 3, clay with flints or clay with gravels (with more or less pebbles); *Series* 4, sand; *Series* 5, calcareous formations.

The characteristic association of the soils of *Series* 1 is the damp *Molinia* lande, which is replaced in depressions by *Sphagnum* bog. Where there is good drainage, either natural or artificial, such a soil may become a good forest soil and Oak and Hornbeam will do well. In most cases, however, lack of drainage causes the forest to deteriorate; Hornbeam disappears and is replaced by Aspen and Birch (*Betula pubescens* and *B. verrucosa*); the Oak (exclusively Pedunculate) has a tendency to become stag-headed; *Molinia* and *Rhamnus frangula* invade the ground. As the trees die, the water table rises and the process of degradation is accelerated.

The subsoil of *Series* 2 is much more permeable and podzolization is more pronounced, but the water table is rarely at any great depth. These soils are suitable for Pedunculate Oak and Hornbeam so long as they are not very acid, but they are very unfavourable to Beech. The typical association on the more favourable of these soils is *Querceto-Carpinetum aretosum*; when the pH exceeds 6, *Acer campestris* appears with certain neutrophile herbaceous plants (*Brachypodium sylvaticum*).

The soils of *Series* 3, owing to the relative permeability of the subsoil, are more strongly leached than those of Series 1 and 2, the degree of leaching depending on the proportion of flints and gravels present in the clay subsoil; they are particularly favourable to Sessile Oak and Beech.

Series 4. Owing to the great permeability of the subsoil, the evolution of these soils is particularly rapid and even those which are least leached belong to the category of podzols. Hornbeam and the typical herbaceous flora of mull soil are always absent from these soils. In Sologne the calcifuge, xerophilous *Q. tozza* is common. Beneath the fairly open stands of Oak, there is a dense ground flora of *Aira flexuosa* and *Pteris aquilina*, but if the cover becomes thinner, these species disappear and are eventually replaced by *Erica cinerea*.

Series 5. These soils are younger than those of the preceding series and present various stages of development. The forest growing on such soils is usually Beech with more or less admixture of Sessile Oak and Hornbeam, and the invariable presence of *Acer campestris* and a

number of forest weeds such as Privet, Hawthorn, Spindle, Dogwood, etc.

Detailed notes are given of a number of soil profiles and floras from typical sites of each of these soil types, and the development of the different soils is described. The process of degradation varies according to the type of soil. In *Series* 1 the chief danger is insufficient aeration which may cause the formation of acid humus. As was stated above, forest is found only on slopes or the banks of drainage channels, etc. In *Series* 2 also the rise of the water table is the most frequent cause of the degradation of the forest, but in this series the natural drainage exercised by the trees themselves is generally sufficient. But when the gley becomes impermeable through the presence of clayey colloids, and especially when destruction of the tree cover allows the water table to rise, degradation begins, aeration becomes insufficient, the humus becomes acid, and the soil is invaded by *Molinia* and Heaths.

The soils of *Series* 3 are often more stable and only the most permeable of the series (those most rich in pebbles) are subject to rapid podzolization. The danger resides equally in the acidity of the subsoil, which is such that even in feebly leached soils the pH is rarely above 5. Under these conditions, if light reaches the soil in greater intensity, and the cover of dead leaves, etc., becomes thinner, the gregarious species quickly establish themselves and the forest is soon superseded by a dry type of lande. The sandy soils of *Series* 4 are in a state of unstable equilibrium and the smallest opening in the forest is immediately invaded by the lande. Podzolization is very rapid.

It appears that, for the regions under consideration, on sufficiently permeable soil (*Series* 3 and 4) the heathy lande on a podzol constitutes a stable paraclimax, resulting from a regressive evolution of the forest association which cannot be reversed without human intervention. For *Series* 1, an equivalent paraclimax appears to be the moist *Molinia* lande, with *Sphagnum* bog occurring very locally. *Series* 2 develops an intermediate form of lande when the forest becomes degraded.

11.41. Soil Physics

[2262]. 11.14.1 : 11.11.2 : 11.22 : 12.19.3. Anderson, H. W. **Soil freezing and thawing as related to some vegetation, climatic and soil variables.** *J. For.* 45 (2), 1947 (94–101). [Univ. of California, Berkeley, Calif.]

This paper presents the results of a study of soil freezing under brush cover, a light grass cover, and in bare soil. The brush cover and, to a lesser extent, the light grass cover, diminished freezing depth, delayed the first occurrence of freezing, and advanced the date of the last freeze of the season, as compared with bare soil. Freezing kept the surface soil wet and resulted in high evaporation rates during rainless periods and rapid soil erosion during rainstorms. Freezing and thawing are shown to be quantitatively related to several variables of microclimate and soil.

[2263]. 11.41.3. Tryon, E. H. **Effect of organic matter on determination of moisture in a forest soil by oven-drying.** *J. For.* 44 (12), 1946 (1089–90). [Division of Forestry, West Virginia Univ.]

In order to determine whether or not soils differing in amounts of organic matter lose relatively different amounts of weight when dried in an oven (the method commonly used for determining dry weight), a comparative study was made of oven-drying and the solvent-distillation method of determining moisture content of a number of forest soils. The differences in the results from the two methods were not significant and it is concluded that the determination of moisture content by the oven-drying method is satisfactory for soils containing appreciable amounts of organic matter.

11.47. Maintenance of Favourable Soil Conditions

See also *For. Abstr.* 8 (Nos. 2699, 2819).

[2264]. 11.47.1 : 07.7. Frazier, D. **Tree-feeding machine.** *Amer. Nurserym.* 84 (9), 1946 (8).

In the course of experiments in the diagnosis of nutrient deficiency at Michigan State College orchards, Dr. T. A. Merritt invented a machine which gives fruit trees injections of dissolved fertilizers. The device, which forces food into the trees under pressure, consists of an air-pressure tank and 4 injection needles connected to the tank by rubber hoses. If, as is hoped, the effects of injections can be detected in a sample tree in as short a time as 2 or 3 weeks, the rest of the trees can be treated by applications made in the usual way, thus saving

a whole year. The injection method of administering food is too slow to be of practical commercial value, as to inject one gallon of liquid into a tree takes 15–40 minutes. The solutions must be very dilute. A tree can stand only 30 g. of ammonium nitrate injected into it, whereas a normal ground application is 3 lb. per tree.

[2265]. 11.47.1 : 12.11.11 : 11.42 : 42.5. THORNTON, S. F., CONNER, S. D., and FRASER, R. R. **The use of rapid chemical tests on soils and plants as aids in determining fertilizer needs.** *Circ. Indiana agric. Exp. Sta.* No. 204 (revised), 1945. pp. 16 + charts in colour.

[2266]. 11.47.1 : 23.26.4 : 21.3. GREAT BRITAIN. **Report for the war years, 1939–45.** Rothamsted Experimental Station, Harpenden. 1946. pp. 269 + maps.

Manurial experiments were laid out on 4 nurseries and in boxes at Rothamsted in 1945. All the nursery experiments included Sitka Spruce and Ash, with Scots Pine and Birch in addition at one nursery. The preliminary indications from shoot growth in the first season are that much of the benefit from composts, especially in wasteland or woodland nurseries, can be ascribed to the plant nutrients they supply, and that some of the differences between nurseries can be interpreted in terms of the nutrient status of their soils as shown by soil analysis and by the responses to fertilizers. In box experiments with a slightly calcareous old nursery soil, on which Sitka Spruce had consistently failed, large plants were grown on soil which had been acidified, the height corresponding to the amounts of acid added (p. 58).

[2267]. 11.47.1 : 23.26.4 : 21.3. WILDE, S. A. **Difficultly soluble sources of nutrients; their use in forest nurseries.** *J. For.* 44 (12), 1946 (1082–6). [Soils Department, Univ. of Wisconsin.]

The availability of difficultly soluble plant nutrients was studied in sub-irrigated pot cultures, using Jack Pine, Red Pine, White Spruce, Yellow Birch and White Elm as indicators. Applications of raw acid peat, rock phosphate, and feldspar to a soil deficient in nutrients, greatly improved the growth of seedlings, but failed to produce stock large enough to satisfy nursery standards. Stock of adequate size was produced by means of supplementary treatment of the soil with liquid fertilizers or by the addition of hardwood/Hemlock duff. The addition of dolomitic limestone depressed the growth not only of acidophilous conifers and Yellow Birch, but also of lime-tolerant White Elm. This indicated that the depressing effect of the limestone was due to stimulation of cellulose decomposers which consumed most of the available nitrogen. The application of difficultly soluble fertilizers was found to be desirable as a means of reducing the concentration of the soil solution, but the success of such treatments is likely, in many instances, to depend upon supplementary use of readily soluble fertilizers in solution, or composts and catch crops. *Author's summary.*

[2268]. 11.47.1 : 23.27. BEILMANN, A. P. **Shade tree fertilization.** *Amer. Nurserym.* 84 (9), 1946 (7–8, 47–9).

A semi-popular account of the experiments in artificial feeding of trees carried out at the Missouri Botanical Garden. Work was done on mature trees, growing in normal conditions. It was found that a complete fertilizer gave the best results, and as a result of continually varying the formula to agree with observed results, the present applications are 25 lb. of 10–8–6. Control trees or groups of trees were not used, owing to unreliable comparability. The value of a fertilizer was therefore checked by the difference in growth rate of a tree when fertilized and the growth rate of the previous season when not fertilized. This required many twig measurements and many increment borings and diameter measurements. There appears to be no substance in the objection which is sometimes made to artificial feeding—that the effects quickly wear off. Fourteen years ago a group of 7 Pin Oaks (*Quercus palustris*) were fed 25 lb. of 10–8–6 at a time when they were in very poor shape and were making an annual diameter increment of only 0·1 in. The year after feeding, the diameter increment was 1·35 in., the length of the terminal shoot had increased from 2 in. to an average of 32 in., and at the present time they still grow 11 in. in height each year. The following rule of thumb has been worked out to give the quantities of complete fertilizer which can be safely applied: height of tree in ft. + branch spread in ft. + girth in inches = lb. weight of

fertilizer. The only deviation from these measurements has been in the case of forest trees—if they have a very small crown, one-third of the calculated dose is given. The best time to apply fertilizer is in the early spring so that the long succulent shoots have time to harden before winter. [Cf. *For. Abstr.* 8 (No. 1603).]

[2269]. 11.47.13 : 12.26–8 (73). CUMMINGS, W. H. **Black Locust plantation soil treatment for increased post production.** Tennessee Valley Authority, Department of Agricultural Relations. 1944. pp. 4.

A progress report on test plantings of Black Locust made in northern Alabama and Georgia to estimate the value of various soil-improving treatments on the production of an early yield of posts. The plantings were set out early in 1941 on Highland Rim grey soils and Valley red soils in Alabama, and on Clarksville and Apison soils in Georgia. A summary of four years' progress is made. Phosphating favoured the establishment and early growth of Black Locust on all plantings. Plantings on all four soil groups should be phosphated at the rate of 200 lbs. of 'triple-super' per acre. Liming was beneficial on some soils and, as a source, calcium silicate slag was as effective as ground limestone. On Highland Rim grey soils, slag or limestone should be added at 2 tons per acre. On Valley Red soils, lime additions need not be more than 1 ton per acre. On Clarksville soils no addition of lime is necessary. On Apison soils, limestone or slag should be applied at 2 tons per acre in addition to phosphate. Potash did not improve growth.

11.6. *Hydrographical Conditions. Water and Soil Conservation*

See also *For. Abstr.* 8 (No. 2855).

[2270]. 11.62 (494) : 91.3. BURGER, H. **The water complex of the Melera Valley.** Translation of summary, by A. L. Griffith. *Indian For.* 72 (12), 1946 (569–72). Cf. *For. Abstr.* 8 (No. 71).

[2271]. 11.62 (73) : 91.3 : 60.32. WILM, H. G. **The status of watershed management concepts.** *J. For.* 44 (11), 1946 (968–71).

The author outlines the development during the last 50 years of the arguments for and against the value of forest vegetation as a protection to catchment areas, and concludes that the usefulness of vegetation is determined by the relative value and demand for water, weighed against the hazards of flood and erosion. Where such hazards are great, watershed management must consist largely in the protection and restoration of plant cover. Where, on the other hand, flood risks are low and the demand for water is high, management practices may include the manipulation of vegetation so as to minimize water consumption, while still protecting the capacity of the land for continuous production of water and other resources.

[2272]. 11.62 (79.7) : 91.3. GRONDAL, B. L. **The Cedar River watershed of the City of Seattle.** *Univ. Wash. For. Cl. Quart.* 17 (1/3), 1943–44 (5–8).

Proposals to prohibit the logging of a large stand of commercially valuable timber in the Cedar River catchment area from which Seattle obtains its water supply, excited much controversy in the autumn of 1943, and a commission of sanitary engineers and foresters was appointed to investigate the question. After careful analysis of the available data, the commission concluded that, in view of the extremely porous soil and natural storage capacity of the area, there was little danger of erosion or excessive run-off as a result of properly supervised logging. Records from gauging stations on the Cedar River for a period of 50 years indicate that the removal of almost half the timber from this area has had no significant effect on run-off. On the other hand, a similar degree of logging in the Green River catchment area a few miles further south has had a marked effect on run-off, which has increased considerably during the rainy season, while the amount of water available during the dry summer months has decreased seriously. The geology of the area, which is very different from that of Cedar River, is no doubt responsible for this different reaction to logging; the soil is relatively thin and the underlying rocks are impermeable, and unless trees are present to build up humus, water runs off immediately.

[2273]. 11.62 : 12.11.14 : 12.19.22 (79.1). **Annual report of the Southwestern Forest and Range Experiment Station: calendar year 1945.** U.S. Forest Service. 1946. pp. 33.

An experiment was conducted on water use by native plants in the semi-desert and chaparral zones above Roosevelt Reservoir in central Arizona. Transpiration and evaporation combined, from areas for chaparral vegetation (including evergreen shrubs which transpire water even when dormant) are slightly more than evaporation from bare soil. However, the benefit of the plant cover in checking soil erosion and silt deposition in reservoirs outweighs many times the value of the slight amount of water used by the plant cover (pp. 18–19).

[2274]. 11.62.11 (54). WARREN, W. D. M **Contour trenching.** *Indian For.* 72 (12), 1946 (581–4). [Ghumsur North Division, Orissa.]

The aim of contour trenching should be to hasten the establishment of a vegetative cover. Deep trenches are both unnecessary and expensive, and the distance between trenches should not be less than 70 yards. The cost of trenching at the above spacing is about Rs. 4 per acre. In assessing the length of time which must elapse before planting up is begun, natural plant succession must be taken into account. Grasses must precede trees, and the natural appearance of woody species in the succession is an indication that tree planting may be taken in hand. In the case of a badly eroded area in the Bijaipur, Khurchutta forests of Santal Parganas, Bihar, six years elapsed before the site was fit for planting, but the time could probably have been reduced if closure to grazing had been more rigidly enforced.

[2275]. 11.62.11 (54.1). AHMAD, Y. S. **Soil conservation in Bengal.** *Indian For.* 72 (12), 1946 (576–80). (7th Silvicultural Conference (1946), Dehra Dun.)

A brief account is given of soil conservation experiments carried out by the Imperial Council of Agricultural Research at Shantiniketan together with suggestions for improvements in technique. Regulation of felling under a proper working plan with a much longer rotation will not in itself be sufficient to conserve and rebuild the severely eroded soil of West Bengal. Along with engineering works like the construction of contour bunds, fire protection will be necessary, and grazing will have to be drastically controlled.

[2276]. 11.62.11 (68). ROUX, E. **The veld and the future.** The African Bookman, Cape Town, 1946. pp. 59. Price 5*s.* 0*d.*

A small book, in untechnical language, on the subject of soil erosion and conservation, with particular reference to South African conditions, and designed for the instruction of school children, farmers, and the general public.

[2277]. 11.62.11 (68) : 97.1. BENNETT, H. H. **Soil erosion and land use in the Union of South Africa.** Department of Agriculture and Forestry, Pretoria. 1945. pp. 28. [U.S. Soil Conservation Service.]

A short, well illustrated account by the chief of the U.S. Soil Conservation Service of a visit to South Africa for the purpose of observing erosion and advising on anti-erosion measures from American experience.

[2278]. 11.62.11 (73) : 60.31. SHEPARD, W. **Food or famine: the challenge of erosion.** Macmillan Company, New York. 1945. pp. x + 225 + plates. Price 12*s.* 6*d.*

Essentially an exposition, in non-technical language, of the problems and methods of soil conservation, with particular reference to conditions in the United States. There are a number of well chosen and reproduced illustrations. Twenty-one pages are devoted specially to the organization of U.S. forest management and subsequent sections deal with the public control of forest exploitation, public land ownership and acquisition of virgin forests and the control of forest devastation on watersheds. The need for forest credit in the transition stages from liquidation to management is discussed as part of the general problem of financing land reconstruction.

[2279]. 11.62.11 (931). BELL, J. E., and CAMPBELL, D. A. **Soil erosion.** *N.Z. J. Agric.* 71 (6), 1945 (587–99). [Department of Agriculture, Wellington.] O.R.E.

A general review of the erosion situation in New Zealand with suggestions for erosion control on grazed hills and arable land. New Zealand is fortunate in that the main crop, permanent pasture, is a protective one as far as erosion is concerned. On steep slopes, however, it is very difficult to prevent the soil slipping, whatever the vegetative cover. Scars

show that slipping occurs even in native bush, but through the rapidity of soil formation the loss is soon made good. To mitigate soil erosion in steep country there are three alternatives: (1) to encourage the growth of a thicker sward of grass; (2) to allow the area to revert to scrub and native bush; and (3) to plant trees. Once rows of trees such as Poplars have been established, the ground between them can still be used for grazing. A map is given showing comparative areas of forest in New Zealand in 1850 and 1938.

[2280]. 11.62.11 : 61.32 (54). **Air survey and soil erosion. An investigation into the possibility of using air photography to assist in dealing with soil erosion.** With foreword by A. P. F. Hamilton, and appendix. *Indian For.* 72 (9), 1946 (399–433 + plates).

The Air Survey Company Limited, of Dum Dum, discusses the use of aerial photography in determining the extent and severity of erosion in specific areas. In spite of difficulties of stereoscopic interpretation arising out of lack of local knowledge, air photographs have proved to be of great value in indicating the extent of gullying and sheet erosion. One of the difficulties lies in distinguishing between land lying fallow as a result of sheet erosion and land in fallow as a result of rotation only. Air reconnaissance is complementary to and not a substitute for ground reconnaissance.

For aerial photographs of this type a scale of not less than 3 in. and not more than 4 in. to one mile is recommended, but mapping at 6 or 8 in. to 1 mile is advisable except around townships where a maximum scale of 12 in. to the mile might be used. Twenty-six photographs of eroded areas are reproduced, and notes are given on their interpretation.

[2281]. 11.62.31 (43.6) : 11.62.11 : 38.8. GLOVER, SIR H. **Land management in relation to flood control in Austria.** *Emp. For. Rev.* 25 (2), 1946 (197–201 + plates).

Brief notes on the measures taken to prevent and regulate floods in Styria and Carinthia. These include torrent training, embankments, management of alpine pastures and farmlands, preservation of forests in catchment areas, and the creation of a special stream regulation department (Wildbachverbauungsverwaltung).

12. FOREST BOTANY. TREE SPECIES

12.1. *General Botany*

12.11. Physiology. Reproduction. Growth

12.11.1. *Metabolism. Plant Constituents. Translocation. Growth Substances*

See also *For. Abstr.* 8 (Nos 2273, 2340, 2367, 2655, 2663).

[2282]. 12.11.11. ROBINSON, W. O., and EDGINGTON, G. **Minor elements in plants, and some accumulator plants.** *Soil Science* 60, 1945 (18–28). [U.S. Bureau of Plant Industry, Beltsville, Md.] O.R.E.

Includes tables showing the partial inorganic composition (dry weight basis) of the leaves of *Symplocos tinctoria* and *Lycopodium flabelliforme* (both rich in aluminium); the inorganic composition of mature Hickory and Pecan leaves; and the rare-earth content of Hickory leaves. Notes are given on the occurrence of aluminium, arsenic, barium, boron, cobalt, copper, fluorine, iodine, manganese, molybdenum, rare earths, selenium, silicon, vanadium and zinc in plants generally.

[2283]. 12.11.11 : 12.26–8. CHENERY, E. M. **Are Hydrangea flowers unique?** *Nature* 158 (4007), 1946 (240–1).

An examination of all available members of the families Melastomaceae and Rubiaceae in Trinidad showed that the capacity to accumulate aluminium is, so far as can be ascertained, most strongly developed in the more advanced of the woody tribes. The tests used are briefly described. The cell-sap acidity range of aluminium-accumulating plants was found to be pH 3·6–5·5 and the distribution was greatest at pH 3·6–4·0.

[2284]. 12.11.11 : 12.26–8 : 31.8. CHENERY, E. M. **Aluminium in trees.** *Emp. For. Rev.* 25 (2), 1946 (255–6). [Department of Agriculture, Trinidad and Tobago.]

The writer reviews the literature on the subject, and lists all the woody genera which have been recorded as aluminium accumulators. These are: *Orites, Kibara, Camellia, Eurya, Schima, Stewartia, Melastoma, Platycentrum, Leandra, Meriania, Conostegia, Heterotrichum, Mecranium, Henriettea, Necrameum, Memecylon, Aporosa, Baccaurea, Hicoria, Cornus,*

Symplocos, Diclidanthera, Coussarea, Rudgea, Chasalia, Saprosma, Palicourea, Erisma, Vochysia, Qualea, Tococa, Maieta, Adelobotrys, Osbeckia, and *Craterispermum.* [Cf. previous abstracts and *For. Abstr.* 8 (No. 311).]

[2285]. 12.11.14 : 12.26–8 (56.9). POLJAKOFF, A. **Ecological investigations in Palestine. I. The water balance of some Mediterranean trees.** *Palest. J. Bot. (J. Ser.)* 3 (3), 1945 (138–50 + plate).

The species investigated in this study were *Olea europaea, Ceratonia siliqua, Amygdalus communis.* The root system of *Olea* and *Ceratonia* is limited to the shallow soil stratum covering the limestone rocks; the roots of *Amygdalus* penetrate deeply into the limestone. The Almond is a 'water spendthrift', whereas *Olea* and *Ceratonia* are much more thrifty in their water spending. No summer dormancy could be detected in *Olea* and *Ceratonia,* which are physiologically active all the year round. *From author's summary.*

[2286]. 12.11.15 : 12.11.22. GREAT BRITAIN **Annual Report (thirty-third year), 1945: East Malling Research Station, near Maidstone, Kent, 1st January, 1945 to 31st December, 1945.** Kent Incorporated Society for Promoting Experiments in Horticulture. 1946. pp. 148 + plates.

A general survey of the hormone relations of the fruit tree is being undertaken. Little is known of the naturally occurring plant hormones, except for the auxin group. In the first instance, techniques of extraction will have to be developed for woody tissues. Once these are satisfactorily standardized, the course of auxin production during the year will be followed in different regions of the tree, and comparisons will be made between different varieties to ascertain if there is any relationship with habits of growth, stock effects, etc. One aspect of this survey will concern the propagative power of different root stocks; another will concern the nature of hormone translocation. For the latter enquiry, transport experiments with synthetic growth substances may also provide a link between auxins and other natural hormones, since a great number of synthetic compounds with a whole range of chemical structure are now being produced, with physiological activities differing greatly from those of auxin (p. 28).

[2287]. 12.11.15 : 12.11.22 : 12.11.3 : 23.23.15 : 23.24.1. HALL, M. A. **Reducing seed-to-timber time: progress shown in producing timber more quickly.** *Sth. Lumberm.* 173 (2177), 1946 (223–4).

A brief review of work done in the United States on the acceleration of tree growth by treatment of seeds or cuttings with growth substances. Soaking roots in indolebutyric acid improves root growth of several species of conifers and hardwoods. Treatment of Pine seeds with colchicine can produce polyploids with increased growth speed under laboratory conditions but the need for skilled operation and its uncertainty exclude the method for practical use.

12.11.2. *Reproduction. Propagation. Growth*

See also *For. Abstr.* 8 (No. 2287).

[2288]. 12.11.21 : 12.25 : 12.14.7. ALLEN, G. S. **The origin of the microsporangium of *Pseudotsuga*.** *Bull. Torrey bot. Cl.* 73 (6), 1946 (547–56). [Univ. of British Columbia, Vancouver, B.C.] O.B.D.

[2289]. 12.11.21 : 12.25 : 12.13. ALLEN, G. S. **Embryogeny and development of the apical meristems of *Pseudotsuga*. I. Fertilization and early embryogeny.** *Amer. J. Bot.* 33 (8), 1946 (666–77). [Univ. of British Columbia, Vancouver, B.C.] O.B.D.

[2290]. 12.11.22 : 12.14.8. GREAT BRITAIN. **Annual report (thirty-third year), 1945: East Malling Research Station, near Maidstone, Kent, 1st January, 1945 to 31st December, 1945.** Kent Incorporated Society for Promoting Experiments in Horticulture. 1946. pp. 148 + plates.

The relation of percentage bark to vegetative vigour has been further investigated, both in Apple rootstocks and in other plants, particularly *Prunus.* Observations have shown a possible correlation between anatomical structure and tendency to root from stems in a large range of different woody plants. This correlation should be useful in assessing propagation qualities in possible new rootstocks (p. 18).

[2291]. 12.11.22 : 12.25 : 12.11.15. DORAN, W. L. **Vegetative propagation of White Pine.** *Bull. Mass. agric. Exp. Sta.* No. 435, 1946. pp. 16.

Cuttings from young trees root better than those from old, and those taken in winter better than those taken at midsummer. Cuttings should be taken from wood of the last growing season and should consist of small twigs from lateral branches of the lower limbs, with none of the needles removed. Cuttings from some individuals are more responsive than those from others to treatment with growth substances, but a short immersion in a concentrated solution of indolebutyric acid often improves rooting. Cuttings rooted equally well in freshly prepared and in previously used sand peat. Sterilizing the medium by steaming did not affect rooting. The presence or absence of mycorrhizal or other soil fungi did not appear to be important. A sand-sedge peat, if not too wet, gave good results. High relative humidity, as maintained by an automatic humidifying unit, is important. Rooted cuttings are developing into normal, well-formed trees [cf. *For. Abstr.* 2 (298), 8 (No. 1630).]. *From author's summary.*

[2292]. 12.11.22 : 12.26–8 : 23 : 21. Rodionenko, G. I. Biologicheskie osobennosti turangi—*Populus diversifolia* Schrenk. **[Biological peculiarities of the Turanga—*P. diversifolia*.]** *Sovetsk. Bot.* 13 (6), 1945 (35–40). [Russ.] [V.L.Komarov Botanical Institute, Academy of Sciences of the U.S.S.R.] O.B.D.

P. diversifolia grows in the northern Lake Balkhash region, singly or in small woods. It has incompletely developed capsules lacking normally developed seeds; the capacity for regeneration by seed appears to have been lost, and the species maintains itself in nature exclusively by root suckers. As a native and decorative species it is well worth planting in settlements in Central Asia, particularly those of the dry steppe and desert areas.

Propagation tests in the Balkhash Botanic Garden showed that it is difficult to find a suitable method under conditions of excessive salt in the soil, frequent dry winds, and watering with saline water from Lake Balkhash (14–16 g. soluble salts per litre). Green summer cuttings and sowing were failures. Lignified 2-year cuttings planted on 29th April and 9th May gave no rooting but had mostly formed callus towards the end of May before succumbing to the hot dry weather of June; heteroauxin treatment appeared to have no effect. It is believed that lignified cuttings would root if planted at the end of March or thereabouts, in time to survive the hot weather. Propagation by root suckers at this time of year is an entirely reliable method.

Dode regarded all Poplars of the section *Turanga* (including *P. pruinosa*, *P. diversifolia* and the scarcely distinguishable *P. litwinowiana* and *P. ariana*) as halophytes, but this is open to doubt. In the populations known to the author, *P. diversifolia* appears to be normally markedly protandrous, which may possibly account for the infertility of the seed.

12.11.3. *Heredity. Breeding. Hybridization. Races and questions of provenance. Cytology*

See also *For. Abstr.* 8 (No. 2287).

[2293]. 12.11.3 : 12.25–9. Darlington, C. D., and Janaki, E. K. **Chromosome atlas of cultivated plants.** George Unwin and Son, Ltd., London. 1945. pp. 397.

After an introductory essay of some 40 pages on the origin of cultivated plants and the use and meaning of chromosome numbers, there follows the 'atlas', i.e. tabulated information on vernacular names, chromosome numbers, author (of chromosome count), use and distribution, of more than 11,000 species of plants belonging to 2,000 genera arranged by families. Genera in which apomixis is known are noted, since its occurrence is usually related to ploidy. Cultivated forms are distinguished from wild species. The bibliography contains about 1,400 references.

[2294]. 12.11.3 : 12.25 (79.4). Stockwell, P., and Righter, F. I. ***Pinus*: the fertile species hybrid between Knobcone and Monterey Pines.** *Madroño* 8 (5), 1946 (157–60). [Institute of Forest Genetics, Placerville, Calif.] K.

Observations on the growth and silvicultural characters of F_1 and F_2 hybrids of *Pinus radiata* × *P. attenuata*. *P. attenuradiata*, hybr. nov. is described and its morphological characters are tabulated.

[2295]. 12.11.3 : 12.26–8 (68) : 34.24. Philp, J., and Sherry, S. P. **The degree of natural crossing in Green Wattle, *Acacia decurrens* Willd. and its bearing on Wattle**

breeding. *J. S. Afr. For. Ass.* No. 14, 1946 (1–28).

It has been shown that Green Wattle (*Acacia decurrens*), when grown in plantations, is naturally cross-pollinated to the extent of between 85 and 95 per cent. The same is probably true of Black Wattle (*A. mollissima*). The natural fertility of Green Wattle was about 72 per cent. and, when crossing was prevented, self-fertility was about 27 per cent. Selfed pods, with the exception of those on one tree, were shorter than natural pods and had fewer seeds. Natural and selfed seed did not differ in weight or volume, but natural seed germinated better than selfed seed (79 as against 62 per cent.). Cellophane bags were superior to grease-proof bags for selfing, and a better set of selfed seed was obtained when the leaves were trimmed off flowering branches.

Owing to the high degree of natural crossing there is a high proportion of heterozygous trees; certainly 7, and probably 12, of the 17 trees tested in 5 different areas, were found to be heterozygous for seedling leaf characteristics. Wattle displays a high degree of heterosis and it is believed that a breeding programme should produce a good effect on the yield of bark and timber. Australian material should be imported to South Africa, because inbred lines of this and South African Wattle might provide the maximum degree of heterosis and also contain genes for desirable characters which are not found in the South African crop. Evidence is given to show that hybrids between Black and Green Wattle occur naturally, and the authors have produced them artificially. Some of the disadvantages and difficulties of carrying out a breeding programme with Wattle as compared with a less tall, annual crop are discussed. *From authors' summary.*

[2296]. 12.11.3 : 12.26–8. JOHNSSON, H. **Triploidy in *Betula alba* L.** *Bot. Notiser, Lund* No. 1, 1944 (85–96). [E.e.] [Institute of Forest Tree Breeding, Ekebo, Kallstorp, Sweden.] A.P.B.

Two 42-chromosome (triploid) and one probable triploid belonging to *B. alba* are described, with measurements of leaf size, stoma length and pollen diameter, and observations on ♀ fertility. Meiosis was studied in two trees. Detailed observations of syndesis were not possible, but tri- and univalents occur and other irregularities are displayed at meiosis. The triploids are of two distinct types and it is concluded that one type is the F_1 between *B. verrucosa* and *B. pubescens*, and the other an autotriploid *B. verrucosa*. The numerous intermediates between *B. verrucosa* and *B. pubescens* can be attributed only to a small extent to direct hybridization between the two species, and it is suggested that hybridization between autotriploid *B. verrucosa* and *B. pubescens* may contribute to this diversity in form. *From author's summary.*

[2297]. 12.11.3 : 12.26–8 : 44.3 : 12.21. URQUIJO, P. Aspectos de la obtención de hibridos resistentes a la enfermedad del castaño. [**Some factors in producing hybrids resistant to the ink disease of Chestnut.**] *Bol. Patol. veg. Ent. agríc., Madrid* 13, 1944 (447–62). [Span.] [Estación de Fitopatología Agrícola de La Coruña.] I.M.I.

Two difficulties in the breeding of *Castanea crenata* ♂ × *C. sativa* ♀ hybrids are the differences in times of flowering of the two species and the extreme difficulty of vegetative propagation. The technique of pollination is described, and an outline is given of experiments (totally unsuccessful) to produce new plants by means of cuttings. Although many of the cuttings sprouted, root formation did not take place. Slightly better results were obtained with layers from trees which had been cut level with the ground: at the end of 14 months 6 had developed a good root system, 12 had not struck root and 14 had died.

[2298]. 12.11.3 : 12.26–8 (75.6) : 21.0. NEWCOMER, E. H. **A three-year trial of hybrid Poplars in North Carolina.** *J. Elisha Mitchell sci. Soc.* 62 (1), 1946 (77–80). [Dept. of Botany, Univ. of N. Carolina, Chapel Hill, N.C.] L.S.

Trials were made of 67 hybrids, selections and pure species, planted as cuttings, on 3 sites, one of which was abandoned at the end of the second year, while the other two were destroyed after 3 years by a logging operation. The tallest measured tree was 38 in. Though mortality was very low, growth was at no time vigorous. During warm midsummer weather there was much leaf-curl and defoliation, with partial recovery and fresh foliation in the cool weather of the fall. Cultivation twice in the second spring effected no perceptible improvement. Considerable trouble was taken to make

the soil site and cultural practices conform with those at Midland, Michigan, the source of most of the trees. The poor site and the cultural practices could not entirely account for the unsatisfactory results. That the trees, which thrive in Michigan and New England, should not succeed in the warmer climate and longer growing season of N. Carolina, constitutes an exception to the generalization that hardwoods are readily adaptable to a warmer climate, though it is not suggested that climate is the only factor involved.

It would seem wise for any region, besides making trial introductions of trees promising elsewhere, to begin selection and breeding of the best local material.

[2299]. 12.11.3 : 12.26–8. Esson, J. G. **Fastigiate Oak reproduced from seed.** *J. N.Y. bot. Gdn.* 47 (563), 1946 (275).

Of three acorns collected in 1931 from a specimen of *Quercus robur* var. *fastigiata* growing at Great Neck, Long Island, two produced ordinary English Oaks with spreading branches, and the third a fastigiate tree (now 34 ft. tall).

12.14. Organography. Morphology. Anatomy. Histology

[2300]. 12.14.3 : 12.25. Pitot, A. L'évolution du bois primaire dans les radicelles de *Pinus halepensis.* [**The development of primary xylem in the radicles of *Pinus halepensis.***] *Rev. sci., Paris* 83 (Fasc. 2, No. 3241), 1945 (109–13). [F.] D.S.I.R.

[2301]. 12.14.3 : 12.25 : 12.14.2. Pitot, A. Remarques sur l'évolution du bois primaire dans le système radiculaire de *Pinus halepensis.* [**Remarks on the evolution of primary xylem in the root system of *Pinus halepensis.***] *Rev. sci., Paris* 83 (Fasc. 4, No. 3244), 1945 (237–8. [F.] D.S.I.R.

[2302]. 12.14.3 : 12.25. Pitot, A. L'émission des membres secondaires dans le système radiculaire de *Pinus halepensis.* [**The origin of secondary roots in the root system of *Pinus halepensis.***] *Rev. sci., Paris* 83 (Fasc. 3, No. 3242/3), 1945 (173–8). [F.] D.S.I.R.

[2303]. 12.14.5 : 12.26.8 : 01.7. Connecticut. **Connecticut State Entomologist; forty-third report, 1943.** *Bull. Conn. agric. Exp. Sta.* No. 481, 1944. pp. 324.

To determine certain effects of defoliation of Elm trees, it has been necessary to establish a valid basis for measuring and sampling the leaves. The details of the procedure are reported because of their adaptability to a wide range of related problems. The curve represented by the formula $Y = 0{\cdot}6818\ X + {\cdot}0143$ may be used for computing leaf area, where Y = area and X = length of leaf. The mean produc t from a random selection of leaves on a tree may be substituted for X in the above equation to obtain the area of the average leaf. This provides a convenient means for estimating the total leaf area of a tree.

Samples were taken (1) 50 from the top branch, a centre branch and the lowest branch of the crown, (2) 50 from the branches of the middle of the crown, (3) a random sample of 50 from the remaining leaves of the tree placed in a container. All the leaves were then measured and the results compared with the estimates made on the basis of the various samples. It was found that the greatest accuracy was achieved by method (2), a centre sample. The method of selecting samples (1) and (2) was to commence at the top of a branch, proceed towards the trunk and back on the opposite side of the same branch, removing alternate leaves.

12.19. Geographical Distribution. Plant Geography and Sociology

See also *For. Abstr.* 8 (Nos. 2261, 2361, 2691, 2799).

[2304]. 12.19. Rikli, M. Das Pflanzenkleid der Mittelmeerländer. [**The vegetation of the Mediterranean countries.**] Verlag Hans Huber, Bern. [Vol. 2] Pt. 9, 1946. pp. xv + 913–1093. [G.g.]

See *For. Abstr.* 8 (No. 112). The present part completes the volume with a continuation of Chap. 12 (plant immigration; natural areas of the species of the region), followed by a summary in 47 pages of the whole work.

[2305]. 12.19 (67.8) : 43 : 13.15 : 13.2. Moreau, R. E. **Kilimanjaro and Mount Kenya: some comparisons, with special**

reference to the mammals and birds; with a note on Mount Meru. With a bibliography of Kilimanjaro by C. Gillman. *Repr.* from *Tanganyika Notes & Rec.* No. 18, 1944. pp. 41.

The writer discusses in some detail the extent and continuity of the forest belt on Mount Kilimanjaro and concludes that Engler's statement about a break in the forest on the north side of the mountain is wrong, but that a process has started, evidently in recent historical times, which will soon make the statement come true unless protection is effective. What was presumably a stable relationship between forest ring and moorland shows signs of breaking down, especially on the north, through fire on the upper edge of the forest. It is uncertain how far this is due to human agency and how far to a drier climate. Annotated lists are given of animals and birds.

[2306]. 12.19 (68 : 67) : 07.8. HUTCHINSON, J. **A botanist in southern Africa.** P. R. Gawthorn, Ltd., 55 Russell Square, London, W.C.1. 1946. pp. xii + 686 + plates + maps. [Royal Botanic Gardens, Kew.] P.R.

An account of the author's botanical explorations in various parts of southern Africa, chiefly in the Union but extending as far north as Lake Tanganyika, in 1928–30, illustrated by numerous photographs of vegetational types and line drawings of individual species. The last section of the book deals with certain more general subjects including (1) the floral regions of South Africa; (2) a review of South African botanical literature; (3) notes on the history of botanical exploration in South Africa; and (4) a new phylogenetic arrangement of the families of seed plants represented in South Africa.

[2307]. 12.19 (72). LEAVENWORTH, W. C. **A preliminary study of the vegetation of the region between Cerro Tancítaro and the Río Tepalcatepec, Michoacán, Mexico.** *Amer. Midl. Nat.* 36 (1), 1946 (137–206).

[2308]. 12.19 (729.7). BEARD, J. S. **The natural vegetation of Trinidad.** *Oxf. For. Mem.* No. 20, 1945 (1946). pp. 152 + plates + map.

A complete set of land-utilization and vegetation maps for the island of Trinidad was prepared on a scale of 1 : 50,000, based upon aerial photographs and ecological survey work done by the forest officers. The vegetation maps applied only to Crown Lands, and showed the different types of (mainly natural) vegetation. The present work is in the nature of an explanatory treatise on the vegetation maps and deals therefore with the vegetation of Crown Lands not alienated for agriculture. The study of communities is based upon Marshall's *Physiography and Vegetation of Trinidad and Tobago*, but with adaptations to tropical American conditions generally [cf. *For. Abstr.* 6 (149)]. The main sections of the monograph are on factors of the environment, the flora, classification of plant communities, descriptions of communities, and ecological relationships.

[2309]. 12.19 (73) : 11.1 : 11.3. GRIGGS, R. F. **The timberlines of northern America and their interpretation.** *Ecology* 27 (4), 1946 (275–89).

The writer summarizes the results of a number of studies made by himself over a long period of years, some published (e.g. on the timberline at Kodiak in Alaska, which is steadily advancing; the timberline in the Rockies, which is stationary) and some unpublished (e.g. on the timberline of Mt. Washington in New Hampshire, which is in regression). He urges that a combination of geological, meteorological and ecological data could give valuable information on what is actually happening in marginal climatic regions and perhaps suggest measures for stopping, or at least delaying the process of climatic deterioration, e.g. by forbidding exploitation of forests without regard to regeneration.

[2310]. 12.19 (75.5). ALLARD, H. A. **Shale barren associations on Massanutten Mountain, Virginia.** *Castanea* 11 (3), 1946 (71–124).

Includes sections on the topography of the shale barrens; their ecology; the zonal distribution of the vegetation; successional stages lacking on the shale barrens proper, the floristics of the shale barrens, and a brief discussion of families and species characteristic of the region. The shale mountains do not represent a single ecological unit. The closed, more or less mesophytic forests at the top and base of the knobs and ridges are composed of species adapted to every degree of mesic and humic conditions, while the highly specialized and almost undisturbed flora of the shale barrens proper reflects the strongly xeric conditions of the habitat. In spite of the thin,

open nature of the forest cover, the vegetation is believed to represent a depauperate phase of the Oak/Chestnut climax. The Chestnut has, however, largely disappeared as a result of blight.

[2311]. 12.19 (76.8). CAIN, S. A. **A biological spectrum of the flora of the Great Smoky Mountains National Park.** *Repr.* from *Butler Univ. bot. Stud.* 7 April, 1945. pp. 14.

An analysis of the flora in accordance with the life-form system of Raunkiær (1934).

[2312]. 12.19 (9) : 09.7. MERRILL, E. D. **Plant life of the Pacific World.** Macmillan Company, New York. 1945. pp. 295. Price 16*s*. [Harvard Univ.]

An attempt is made in this book to cover the region extending from the Aleutians to Hawaii, the Marquesas Islands, and the Galápagos in the east, westward to include all of the Malay asrchipelago and the Papuan region as far south A New Caledonia, as well as, with brief and partly bibliographic notes, the islands adjacent to eastern Asia, from the Kuriles to Formosa and Hainan. It is not a complete treatise of Pacific plant life but is confined to the commonest species and to those of extraordinarily wide geographic distribution. Certain definite types of vegetation in the mass, and various correlated subjects are treated generally.

Chapters deal with:—(1) the *safe* forests and jungles of the tropics; (2) general principles of botanical classification; (3) plants of the seashore; (4) the Mangrove forest; (5) the secondary forests and open grasslands; (6) the primary forest; (7) noteworthy plants of special interest; (8) weeds and their significance; (9) cultivated plants; (10) jungle foods; (11 and 12) problems of Malaysian and Polynesian plant distribution; (13) the significance of certain local plant names; (14) notes on specific islands and island groups; (15) notes on botanical history, exploration, and bibliography; and (16) simple directions for preparing botanical specimens.

The book is amply illustrated with line drawings.

[2313]. 12.19 : 12.21 : 12.11.2. WILKINS, W. H., and HARRIS, G. C. M. **The ecology of the larger fungi. V. An investigation into the influence of rainfall and temperature on the seasonal production of fungi in a Beechwood and a Pinewood.** *Ann. appl. Biol.* 33 (2), 1946 (179–88). [University Department of Botany, Oxford.] O.R.E.

The major factors influencing sporophore production are two, viz. water content of substrate and temperature. The first is sometimes conveniently expressed as rainfall though this is not an exact equivalent. In that both factors must be operative, it is hardly reasonable to say that one is more important than the other, but it is, nevertheless, true that while many species are relatively indifferent to temperature, all are dependent on adequate water supply. Similarly the minimum temperature has more influence than the maximum.

It appears probable that, given favourable water and temperature conditions, fungi could be produced at any time of year, and therefore the periodicity of their appearance is not so much a function of time as of conditions. In a Beechwood, for instance, sporophores could be produced when (1) the water content is above 50 per cent., and (2) the arithmetic mean of minimum temperatures is above 4° C. These two coincide only from the beginning of June to half-way through August, and again from the beginning of September to half-way through October; hence the so-called spring and autumn fungus seasons. The same argument can be applied to a Pinewood except that here perhaps the water-content percentage needs to be slightly higher.

On the whole, it seems that woods offer a better habitat for fungi than open country in that the modifying effect of the canopy enables the fungus season to start earlier, continue longer, and to be more generally equable all round. *From authors' conclusions.*

[2314]. 12.19 : 12.26–8 (66.9). COUSENS, J. E. **Some notes on Iroko in Onitsha and Owerri Provinces.** *Farm and Forest* 7 (1), 1946 (28–32).

An account of a survey and enumeration of timber resources and particularly of Iroko (*Chlorophora excelsa*) in two provinces of Nigeria. Iroko preponderates over other species in village forest because it was retained as a sacred tree both in the formation of village forests from high forest and in clearing land for farming. All the conditions which seem to be necessary for Iroko to grow to a really large tree have disappeared: the fallow period in the native shifting husbandry is now so short

that regrowth is usually limited to dense undergrowth of inferior species; the selective retention of the tree is unlikely to be practised much longer as the old customs and beliefs die out: the area of village forest in which it can regenerate has been decreasing, though there are indications that this process has reached its limit in some areas, where the people are planting up farmland with village forest trees.

[2315]. 12.19 : 12.26–8. FOXWORTHY, F. W. **Distribution of the Dipterocarpaceae.** *J. Arnold Arbor.* 27 (4), 1946 (347–54).

Geographic distribution; latitudinal range; altitudinal range and soil conditions; and methods of distribution. Six great regions of geographic distribution are recognized: Africa; Ceylon; India (Western Peninsula); Eastern Peninsula or Further India; Western Malaysia; and Eastern Malaysia.

[2316]. 12.19 : 12.26–8 (68.7). WEST, O. **Distribution of Mangroves in the Eastern Cape Province.** *S. Afr. J. Sci.* 41, 1945 (238–42). [Division of Soil and Veld Conservation.] A.P.B.

12.19.1. *Regional Floras, including Check Lists*

[2317]. 12.19.1 (728.1). STANDLEY, P. C., and STEYERMARK, J. A. **Flora of Guatemala. V.** *Fieldiana (Bot.)* 24 (5), 1946. pp. v + 502. *Field Mus. Publ.* No. 578.

[2318]. 12.19.1 (79.3). BILLINGS, W. D. **Nevada trees.** *Bull. Nevada agric. Ext. Serv.* No. 94, 1945. pp. 102.

12.19.2. *Forest Types*

[2319]. 12.19.2 (46) : 12.26–8. RODRIGUEZ, F. B. La asociación del *Quercus suber* L. en el *Quercion Ilicis* de la Mariánica y Oretana. **[The *Quercus suber* association in the *Quercion Ilicis* of the Mariánica and Oretana.]** *Bol. Soc. broteriana* 19 (2ª sér. 2ª pt.), 1945 (539–58 + plates). [Span.] [Instituto Español de Edafologia, Ecologia y Fisiologia Vegetal.]

In the Cordilleras of Oretana and Mariánica in Spain, *Quercus suber* normally constitutes associations subordinate to the *Quercetum Ilicis* (*Quercetum ilicis suberetosum*) on moderately acid soils (pH 6·2—6·4) on shaded slopes. On very acid soils it forms what may be considered independent associations (*Quercetum suberis*).

[2320]. 12.19.2 (469) : 12.26–8. BARBOSA, L. A. G. Matos da *Quercus coccifera* nos arredores de Oeiras e Cascais (subsídio fitosociológico). **[The *Quercus coccifera* woodlands in the vicinity of Oeiras and Cascais (phytosociological study).]** *Bol. Soc. broteriana* 19 (2ª sér., 2ª pt.), 1945 (759–85 + tbls. + plate). [Port.e.]

Includes a brief general description of the region studied (a strip of land west of Lisbon); an analytic study and phytosociological description of the Oak forests (predominantly *Quercus coccifera*) which constitute the natural vegetation; notes on other plant communities in the area; and a comparison between the communities present in the vicinity of Oeiras and Cascais and those of the *Quercetum coccifera galloprovincialis* Br.–Bl. (1935) association.

[2321]. 12.19.2 (494) : 11.32 : 11.33. MOOR, M. Die Waldpflanzengesellschaften des Schweizer Juras und ihre Höhenverbreitung. **[The forest plant associations of the Swiss Jura and their altitudinal distribution.]** *Schweiz. Z. Forstw.* 98 (1), 1947 (1–17). [G.f.]

A provisional statement, on broad lines, of what is so far known of this subject (22 refs.). The climax associations, in descending order from the timber-line, are: *Hylocomieto-Piceetum*, *Fagetum* (*rumicetosum*, *abietetosum*, *typicum*, *caricetosum albae*), *Querceto-Lithospermetum* (which Moor would prefer to call *Coronilleto-Quercetum pubescentis*), and *Querceto-Carpinetum*. The distribution of these and other associations (Swiss Jura only) is discussed and a list given of the characteristic species, by layers, of each.

The chief peculiarities of the Jura are (i) the predominance of Beech forest, which intrudes into the Oak/Hornbeam at lower levels and competes with Spruce for a good deal of ground at its upper limit; and (ii) the inability of Spruce, in consequence of serious competition from Beech/Silver Fir, to form a continuous belt, so that, at least on southern aspects, the latter forms the timber-line.

[2322]. 12.19.2 (66.9) : 12.19.3 : 01.2. JONES, A. P. D., and KEAY, R. W. J. **Descriptive terms for the vegetation of the drier parts of Nigeria.** *Farm and Forest* 7 (1), 1946 (34–40).

The first of the two authors recently proposed a set of descriptive terms for the vegetation in the wetter parts of Southern Nigeria, based as far as possible on physiognomic and physiographic features which can be used all the year round [see *For. Abstr.* 8 (No. 117)]. The present article deals in similar fashion with the drier parts of Nigeria. In the dry-zone vegetation of West Africa there are 4 more or less distinct strata. These are:—(*a*) The upper tree layer composed of trees 20–25 ft. high. (*b*) The lower tree layer, composed of trees from 6–8 to 15–20 ft. high. (*c*) The shrub layer of woody species up to 10 ft. high. (*d*) The herbaceous layer of non-woody species, including grasses, and reaching a maximum of about 14 ft.

On the basis of the presence and development of these strata, the following terms are proposed:—(1) Closed savannah woodland, (2) Open savanna woodland, (3) Scrub woodland with emergents; (4) Scrub woodland; (5) Scrub, (6) Grassland, (7) Wooded farmland.

A list is given of recent corrections to the botanical names of some of the species mentioned in the paper.

[2323]. 12.19.2 (68.9) : 12.26–8 : 61.3. Northern Rhodesia. **Department of Agriculture: annual report for the year 1945.** Govt. Printer, Lusaka. 1946. pp. 28.

Further reconnaissances were made in the *Baikiaea* forests in the extreme south-west of Barotseland. The extent of these forests as shown on a vegetation-type map is considerable, but misleading. Most of the forests examined have a well-stocked fringe with a normal understorey, but generally within a quarter of a mile the forest changes to scattered *Baikiaea* trees with a short bushy undergrowth about 3 ft. high. Mixed forests along the frontier of the Caprivi strip are commercially exploitable (p. 16).

[2324]. 12.19.2 (77.4 : 77.5) : 12.19.4 : 09.1 : 09.2. Potzger, J. E. **Phytosociology of the primeval forest in central-northern Wisconsin and upper Michigan, and a brief post-glacial history of the lake forest formation.** *Ecol. Monogr.* 16 (3), 1946 (211–50).

Part I presents data on a phytosociological survey of two stands of Pine and 8 stands of northern hardwoods, in which frequency index, density, fidelity, coverage, and basal area are considered. The sampling unit was 100 sq. metres. Crown coverage in the Pine stands is low, which permits development of an herbaceous layer. A second-layer stratum consists chiefly of *Quercus borealis* var. *maxima*, *Acer rubrum* and *A. saccharum*. Reproduction by the dominant Pines is very poor under the forest canopy, but it is very prolific in open habitats adjacent to the mature stand. *Acer* and *Quercus* do not participate in the sociological complex of a stand of young Pines. Crown coverage in the hardwood stands is 90 to 100 per cent. and there is no herbaceous layer. Species showing highest fidelity, abundance, and frequency are *Acer saccharum*, *Tsuga canadensis* and *Betula lutea*.

Part II discusses briefly the controversies on what constitutes climax in the lake forest. One school of thought considers that Pine/Hemlock, another that Hemlock/deciduous forest is the climax. The latter group, which includes the author of this paper, interprets *Pinus* on sandy soil as post-climax or edaphic climax. The argument is illustrated by a number of pollen profiles. *From author's summaries.*

[2325]. 12.19.2 (77.2). Lee, M. B. **An ecological study of the floodplain forest along the White River system of Indiana.** *Butler Univ. bot. Stud.* 7, 1945 (155–75). A.P.B.

12.19.4. *Succession*

See also *For. Abstr.* 8 (Nos. 2261, 2403, 2796, 2813).

[2326]. 12.19.4 (47.1). Kalela, E. K. Om trädslagsförändringar i Finlands skogar. [**On changes in specific composition in the forests of Finland.**] *Svenska SkogsvFören. Tidskr.* 44 (6), 1946 (450–61). [Sw.f.]

It is only in a favourable environment, where the floristic composition is diversified and several species may be equal in competitive ability in a given habitat, that the climax forest is mixed; with an unfavourable environment the trend is towards the greatest simplicity and uniformity in composition. Finland belongs in the latter category, the climax for the drier sites being Scots Pine, and for the moister, Norway Spruce, in pure stands, a fortunate circumstance since both species are economically so important. Pure or mixed communities

of Birch, Aspen and Grey Alder are seral and are maintained only by fire and the axe. With the abandonment of clear felling and burning for temporary agricultural use and with stricter control of forest fires, Spruce is now gradually returning and displacing hardwoods. The chief types of mixed forest are (i) those with Spruce on moist sites; (ii) those with Pine on dry sites; (iii) other mixed forest, usually on moist sites but without Spruce. Of these (i) tend to revert directly to pure Spruce; (ii) tend to revert directly to pure Pine; (iii) tend to form pure stands of the fittest species on the spot before reaching the true climax. A common type of succession is (*a*) Birch/Aspen/Alder—(*b*) pure Birch—(*c*) Birch/Spruce—(*d*) pure Spruce, in which succession may start at any of the stages (*a*) to (*c*). Certain of the drier site types, e.g. the better *Vaccinium* types, represent a tension zone where with small variations in environmental factors, Spruce is capable of gaining a little ground from Pine.

It is pointed out that a silvicultural treatment conforming in general with these successions will meet a quick response in the forest itself, and that even the effects of maltreatment have been mitigated by the natural trend.

12.2. *Special (Systematic) Botany*

12.21. Fungi

[2327]. 12.21 (74.7). Lowe, J. L. **The Polyporaceae of New York State (the genus *Poria*).** *Tech. Publ. N.Y. St. Coll. For.* No. 65, 1946. pp. 91.

12.25. Gymnosperms

See also *For. Abstr.* 8 (No. 2294).

[2328]. 12.25. Jackson, A. B. **The identification of conifers.** Edward Arnold & Co., London. 1946. pp. vii + 152. Price 9*s*.

This book is intended as an introduction to Dallimore and Jackson's 'Handbook of Coniferae', and for the use of forestry students and others in the identification of conifers in the field. First chapters deal with the general characters of Coniferae, and a key to genera precedes the major portion of the book, which is devoted to the description of genera and species, with 48 illustrations; a key for the identification of species is given for each genus, and under each species are listed noteworthy specimens to be found in the British Isles.

[2329]. 12.25 (96.1–8). Buchholz, J. T., and Gray, N. E. **A Fijian *Acmopyle* [*A. sahniana* n.sp.].** *J. Arnold Arbor.* 28 (1), 1947 (141–3 + plate).

[2330]. 12.25 (79.3). Mason, H. L., and Stockwell, W. P. **A new Pine from Mount Rose, Nevada.** *Madroño* 8 (2), 1945 (61–3). [Univ. of California, Berkeley, Calif.] K.

Pinus washoensis n.sp., a species resembling, in general aspect, its forest associate, *Pinus jeffreyi*, but having smaller cones and a number of important differences in structure, biochemistry and behaviour.

12.26-8. Dicotyledons

[2331]. 12.26–8 (91) : 12.19.1. Ridley, H. N. **Additions to the flora of Borneo and other Malay Islands: XIX.** *Kew Bull.* No. 1, 1946 (31–43).

[2332]. 12.26–8 (91 : 92) : 34.26. Monachino, J. **A revision of *Dyera* (Apocynaceae).** *Lloydia* 9 (3), 1946 (174–202). E.M.B.

Deals mainly with taxonomy of *Dyera* spp., their uses, distribution, cultivation and latex production in the Malay Peninsula and neighbouring islands.

[2333]. 12.26–8. Monachino, J. **A revision of *Hancornia* (Apocynaceae).** *Lilloa* 11 (1), 1945 (19–48). [E.span.] A.P.B.

[2334]. 12.26–8 (7). Fernald, M. L. **Contributions from the Gray Herbarium of Harvard University. No. CLIX. Some North American Corylaceae (Betulaceae). I. Notes on *Betula* in eastern North America. II. Eastern North American representatives of *Alnus incana*.** *Rhodora* 47 (562), 1945 (303–29, 333–61 + plates). O.B.D.

I. Keys to species and varieties of North American Birches. II. See also *For. Abstr.* 8 (No. 950).

[2335]. 12.26–8 (86). Croizat, L. Especies nuevas de la Comision Botanica del Valle del Cauca (Colombia). [**New species of**

the Botanical Commission from the Cauca valley (Colombia).] *Ciencia, Méx.* 6 (10/12), 1945 (353–4). [Span.] [Arnold Arboretum, Harvard Univ.] *Bernardia colombiana* and *Phyllanthus vallianus* n.spp.

[2336]. 12.26–8 (47.9). Sosnovski, D. Originalÿ i autentiki predstaviteley florÿ Kavkaza. I. Autentiki Muzeya Gruzii.—Rod *Quercus* L. **[Originals and authentic specimens of representatives of the flora of the Caucasus. I. Authentic material in the Museum of Georgia.—Genus *Quercus* L.]** *Vestnik Gosudarstvennogo Muzeya Gruzii* 12–A, 1943 (203–39). [Russ.]

Contains:—(i) A brief historical account of research on *Quercus* in the Caucasus. (ii) Synonymy, with an indication of the *locus classicus* and location of type, where known. (iii) Notes on authentic material of species described by Steven, where available in the Georgian Museum. (iv) A diagram and discussion of the probable phylogenetic relationships of the Caucasian species.

[2337]. 12.26–8 (728.4). Tucker, J. M., and Muller, C. H. **Additions to the Oak flora of El Salvador.** *Madroño* 8 (4), 1945 (111–7). [Univ. of California.] K.

[2338]. 12.26–8 (73). Fernald, M. L. **Types of some American trees.** *J. Arnold Arbor.* 27 (4), 1946 (386–94 + plates). [Gray Herbarium, Harvard University.]

A discussion on the taxonomy and synonymy of certain American Oaks and of *Fraxinus americana* with reference to the characters exhibited by the type specimens. Among the *Quercus* spp. discussed are *Q. velutina* Lam. (= *Q. tinctoria* Bartr. ex Michx.), *Q. prinus* (*monticola*) Michx., *Q. rubra* L. and *Q. falcata.*

[2339]. 12.26–8 (86). Uribe-Uribe, S. J., L. Adiciónes a las Leguminosas de Colombia. **[Additions to the Leguminosae of Colombia.]** *Caldasia* 4 (18), 1946 (211–3). [Span.] I.A.B.

[2340]. 12.26–8 : 34.25 : 12.11.11. Wildeman, E. de, and Pynaert, L. Notes sur des *Lonchocarpus.* **[Notes on some species of *Lonchocarpus.*]** *Bull. agric. Congo belge* 37 (3), 1946 (586–97). [F.]

On the chemistry and taxonomy of American and African species.

[2341]. 12.26–8 (67.5). Staner, P. Les Méliacées du Congo Belge. **[The Meliaceae of the Belgian Congo.]** *Bull. Jard. bot. Brux.* 16 (Fasc. 2/3), 1941 (109–251 + plates). [F.] K.

[2342]. 12.26–8 (86). Dugand, A. Nuevas nociónes sobre el genero *Ficus* en Colombia, VI. **[New ideas on the genus *Ficus* in Colombia, VI.]** *Caldasia* 4 (18), 1946 (229–30). [Span.] I.A.B.

Ficus caballina Standl. and *F. loretoyacuensis* Dugand, n.spp.

[2343]. 12.26–8 (7). Palmer, E. J. ***Crataegus* in the northeastern and central United States and adjacent Canada.** *Brittonia* 5 (5), 1946 (471–90). [Arnold Arboretum, Jamaica Plain, Mass.]

[2344]. 12.26–8. Rouleau, E. ***Populus balsamifera* of Linnaeus not a *nomen ambiguum.*** *Rhodora* 48 (569), 1946 (103–10). [Univ. of Montreal.] O.B.D.

This is the valid name for the American Balsam Poplar (*P. tacamahaca* Mill.).

[2345]. 12.26–8. Ball, C. R. **More plant study: fewer plant names.** *J. Arnold Arbor.* 27 (4), 1946 (371–85). [U.S. Department of Agriculture, Washington, D.C.]

Four major classes and causes of variation in the genus *Salix* are discussed: (1) variation of an organ on a single plant; (2) variation of an individual organ during the year; (3) plant variations caused by differing local environments; and (4) actual hereditary differences.

Of the two chief methods of systematic study, the better ('centripetal') method is to obtain the largest possible collection of herbarium specimens and to study these and living plants in the field without reference to previously published descriptions. An example is given of the use of this method in the study of *Salix missouriensis* Bebb.

[2346]. 12.26–8 (7 : 8). Cronquist, A. **Studies in the Sapotaceae—VI. Miscellaneous notes.** *Bull. Torrey bot. Cl.* 73 (5), 1946 (465–71). [New York Botanical Garden, New York.]

Includes *Diploön*, n.gen., and new species of *Oxythece*, *Pouteria*, *Pradosia* and *Syzygiopsis.*

[2347]. 12.26–8 (67.5). HAUMAN, L. Note sur les Ulmacées du Congo Belge. [**Note on the Ulmaceae of the Belgian Congo.**] *Bull Jard. bot. Brux.* 16 (Fasc. 4), 1942 (407–12) [F.] K.

12.29. Monocotyledons

[2348]. 12.29 (59.5). HOLTTUM, R. E. **The classification of Malayan Bamboos.** *J. Arnold Arbor.* 27 (4), 1946 (340–6). [Botanic Gardens, Singapore.]

A re-arrangement of Gamble's classification of Indian Bamboos (*Ann. R. bot. Gdn. Calcutta* 7, 1896) is suggested, based on studies of Bamboo species found in the Malay Peninsula, with a discussion of the taxonomic value of certain morphological characters. Three sub-tribes are recognized: *Melocanneae*, *Bambuseae*, and *Dendrocalameae*.

[2349]. 12.29 (729.6). QUESTAL, A. Les palmiers de la Guadeloupe et dépendances. [**The Palms of Guadeloupe and its dependencies.**] *Carib. For.* 7 (4), 1946 (297–314). [F.E.span.]

13. FOREST ZOOLOGY

13.1. *General Zoology*

[2350]. 13.15 : 13.2 : 91.4. JENKINS, D. W. and CARPENTER, S. J. **Ecology of the tree hole breeding mosquitoes of nearctic North America.** *Ecol. Monogr.* 16 (1), 1946 [*sic*, 1947]. (31–47).

In nearctic North America, 8 species and one sub-species of mosquitoes are restricted to, or nearly always breed in tree holes. Two of these species have been shown experimentally to transmit disease: *Anopheles barberi* carries malaria and *Aedes triseriatus* yellow fever and equine encephalomyelitis. The ecology and life habits of each species are discussed along with rearing experiments [cf. *For. Abstr.* 8 (No. 1071)]. *From authors' summary.*

[2351]. 13.15 : 13.2 (67.6) : 11.22. HADDOW, A. J., GILLETT, J. D., and HIGHTON, R. B. **The mosquitoes of Bwamba County, Uganda. V. The vertical distribution and biting-cycle of mosquitoes in rain-forest, with further observations on microclimate.** *Bull. ent. Res.* 37 (3), 1947 (301–30 + plates). [Yellow Fever Research Institute, Entebbe, Uganda.]

During investigations on the epidemiology of yellow fever in Bwamba County, Uganda, it was found that in the forest area concerned there are two main microclimatic strata. The lower stratum is very cool, humid and equable. The upper, which includes most of the understorey and canopy foliage, shows a much greater daily range and has many points in common with the climate in the open. During wet weather and by night the differences between these strata are much reduced. The relationship of the microclimate to mosquito behaviour is discussed briefly. *From authors' summary.*

13.2. *Special (Systematic) Zoology*

[2352]. 13.2 : 01.2 (73). MUESEBECK, C. F. W. **Common names of insects approved by the American Association of Economic Entomologists.** *J. econ. Ent.* 39 (4), 1946 (427–48). [U.S. Bureau of Entomology and Plant Quarantine.]

[2353]. 13.2 : 01.2 : 01.6. CHAMBERLIN, W. J. **Entomological nomenclature and literature.** Edwards Brothers, Inc., Ann Arbor, Michigan. 2nd ed., 1946. pp. xi + 135. Price 19*s.* 6*d.* [Oregon State College.]

Includes a brief survey of the historical development of nomenclature; the international rules of zoological nomenclature; some general recommendations on entomological nomenclature; a bibliography of entomological literature; and advice on the preparation of scientific articles.

[2354]. 13.2 : 02.1 : 45.3. SCHNEIDER-ORELLI, O. Entomologisches Praktikum: Einführung in die land- und forstwirtschaftliche Insektenkunde. [**Manual of entomology: introduction to agricultural and forest entomology.**] Entomologisches Institut der Eidgenössischen Technischen Hochschule, Zürich. 1945. pp. 149. [G.] I.I.E.

An elementary handbook for classwork with a brief treatment of some of the chief principles of forest entomology illustrated by Swiss examples.

[2355]. 13.2 (72 : 728 : 729 : 8). BLACKWELDER, R. E. **Checklist of the coleopterous insects of Mexico, Central America, the West Indies, and South America. Pt. 4.** *Bull. U.S. nat. Mus.* No. 185, 1946 (551–763). O.R.S.

2. SILVICULTURE

[2356]. 2 (71) : 09.7. MACDONALD, D. A. **Status of silviculture in Canada.** *J. For.* 44 (11), 1946 (982–6).

After a short description of the forest areas and types of Canada, the writer reviews the extent to which the findings of silvicultural research are being put into practice and concludes that, on the whole, there is little silvicultural management in evidence.

[2357]. 2 (73). WESTVELD, R. H. **Silviculture in practice.** *J. For.* 44 (11), 1946 (977–81). [Alabama Polytechnic Institute, Auburn, Ala.]

A review of the extent to which the results of silvicultural research are being put into practice in the United States.

[2358]. 2 : 12.26–8 (86). HORN, E. F. **Growing Balsa in Western Ecuador.** *Carib. For.* 7 (4), 1946 (285–95). [E.span.]

The writer first describes the climate and gives figures of rainfall, in Western Ecuador, and describes the powers of reproduction of Balsa. In order to reduce the cost of clearing operations, cleared land is often leased to share croppers for cereal cultivation for one or two years. Two crops of Balsa should not be grown successively on the same land, owing to the ravages of insect pests. Owing to the extreme intolerance of Balsa, the writer is of the opinion that it should be grown in mixture with more tolerant species such as *Chlorophora tinctoria* or *Cordia alliodora*. Owing to its rapid growth, Balsa can be grown on a very short rotation of 8–10 years, and it would be possible to grow 2 or even 3 crops of Balsa to one of the other species.

[2359]. 2 : 12.26–8 (44) : 12.19 : 35 : 76. VAISSIÈRE, J. DE. Contribution à l'étude des forêts feuillues de l'Ile-de-France. **[Contribution to the study of the broadleaved forests of the Ile-de-France.]** *Rev. Eaux For.* 84 (11), 1946 (655–78). [F.]

The writer first gives an outline of the history of the forests of this area, the gradual substitution of coppice with standards for the original high forest forms, and the progressive disappearance of the Oak, formerly the dominant species. The causes of this last phenomenon are analysed and found to be (1) the lengthening of the rotation, (2) the increased density of stands, (3) the steady fall in the price of firewood compared with that of sawtimber: the combined effect of these factors is to discourage natural regeneration of Oak, which requires plenty of light. The silvicultural and management methods necessary to reverse this process are outlined, but it is emphasized that, in order to make them economically practicable, the costs of production must be reduced by a large degree of mechanization in the work of preparation of ground, planting, sowing, etc., since increased costs are largely due to the rise in wages.

21. SILVICULTURAL CHARACTERS OF TREE SPECIES

21.0. *Adaptability to the General Environment. Acclimatization*

[2360]. 21.0 (213). DREES, E. M. Iets over exoten. **[Notes on exotics.]** *Tectona* 36 (6), 1946 (310–26). [Du.e.]

A general discussion of some ecological principles governing the chances of success of an introduced tree species, with particular reference to the tropics and to the value of knowledge of the optimum in the range of a species (i.e. where it competes and regenerates successfully in primary forest; *not* necessarily where its maximum vegetative growth occurs). Stress is also laid on the need for continuing plantation trials of exotics beyond the first generation, even when the latter may appear completely successful.

[2361]. 21.0 (45) : 11 : 12.19. PAVARI, A., and PHILIPPIS, A. DE. La sperimentazione di specie forestali esotiche in Italia. Resultati del primo ventennio. **[Experiments with exotic forest species in Italy. Results of the first twenty years.]** *Ann. Sper. agr.* 38, 1941. pp. 648 + plates + maps. [It.]

This large and comprehensive work consists of three parts: (1) a general account of the introduction of exotic species into Italy, the experiments on which the work is based, and the relevant ecological conditions in Italy (67 pages); (2) detailed descriptions of the principal exotic species, with notes on experiments in

growing them in Italy and elsewhere in southern Europe (526 pages); (3) the authors' conclusions and recommendations of the most suitable species for planting in Italy. There is a bibliography of 16 pages and maps of Italy showing climatic-forest zones, vegetation, rainfall, etc.

[2362]. 21.0 (46) : 12.26–8. MARTÍN BOLAÑOS, M. Impresiones comentadas sobre los eucaliptos de Sierra Cabello. **[Impressions on the Eucalypts of the Sierra Cabello.]** [*Trab.*] *Inst. for. Investig. Exp. Madrid* 17 (32), 1946. pp. 64 + plates. [Span.]

The author discusses the plantations, with observations on planting costs, average growth and economic returns. A list is given of the species represented, with indications of their economic value. *E. globulus* is first in volume production, but *E. maideni* and *E. rostrata* are more easily cultivated. No serious insect pest has as yet invaded *Eucalyptus* plantations in Spain. Twenty-eight photographs are appended.

[2363]. 21.0 (54) : 23.27 : 23.3. RANDHAWA, M. S. **Trees and their habitat.** *Indian Fmg.* 7 (5), 1946 (230–3 + plate). [Imperial Council of Agricultural Research.] O.R.E.

Includes 6 lists of indigenous and exotic tree species particularly suitable in India for ornament in dry and moist localities, drought-resistant and salt-resistant trees, and species for swamps and marshy areas and for honey and fodder.

[2364]. 21.0 (54.5 : 12.26–8. KHAN, F. G. **The cultivation of some of the genus *Eucalyptus* in the scrub forests of the North-west Frontier Province.** *Indian For.* 72 (11), 1946 (526–8).

As the growth of indigenous species is comparatively slow and the coppice and regeneration stocking of these depleted scrub forests is inadequate, the author has experimented with *Eucalyptus* spp. *E. rudis, rostrata, tereticornis* and *globulus* were tried in the semi-desert round Parachanar (elevation 5,500 ft.; rainfall 25 in. per annum) and at Thai (Hazara) (elevation about 3,900 ft. and rainfall 45 in.). In the former area most of the plants grew well during the summer, but *E. rudis* and *rostrata* were killed out in the subsequent winter. Thirty per cent. of *E. tereticornis* and 40 per cent. of *E. globulus* survived the winter in the open. At Thai *E. globulus* was a failure, but the other three species showed an 80-per-cent. survival.

The Eucalypts have proved intolerant of shade, and further investigations are necessary to determine whether they will form gregarious crops in a natural forest without irrigation, and also at what elevation satisfactory growth will be made.

[2365]. 21.0 (81) : 12.26–8 : 34.24. DOUGHERTY, J. L. **Acacia negra industry in Rio Grande do Sul.** *Agric. in Americas* 6 (9), 1946 (139–41, 147).

Account of the extensive cultivation of *Acacia decurrens* var. *mollissima* on farmyards in Rio Grande do Sul, as a source of tannin and fuelwood and as a soil improver.

21.3. *Soil Requirements*

[2366]. 21.3 : 11.4 : 12.11. HANDLEY, W. R. C. **The soil complex and tree growth.** *J. Oxf. Univ. For. Soc.* (*3rd Ser.*) No. 1, 1946 (34–52).

The writer discusses the various phases of the soil complex (made up of mineral, organic and biological constituents) and their possible relationships to tree growth, and attempts to evaluate the present scanty data available. He outlines some of the subjects on which there is urgent need of research and suggests possible methods of dealing with them. Emphasis is laid on the great difficulty and importance of developing efficient field techniques for measuring e.g. water loss in growing trees, the pH of a soil *in situ*, the constituents of soil atmosphere in undisturbed soil. The basic problem is seen to be the fundamental differences in the biological requirements in the matter of soil conditions for the root environment of the two types of tree represented by, say, Ash and Scots Pine, with other species of tree forming a series between the two extremes. All other aspects of the tree/soil relationship may be regarded as facets of this basic problem. The present state of knowledge of the microbiology of the soil and particularly of mycorrhizal relations is considered in some detail, and possible fruitful lines of research are suggested.

[2367]. 21.3 : 12.11.12. LEYTON, L. **Factors in tree nutrition.** *J. Oxf. Univ. For. Soc.* (*3rd Ser.*) No. 1, 1946 (55–61).

A brief summary of the present state of

knowledge in this field with particular reference to the more important investigations which have been responsible for the major advances. The subject is surveyed under the following heads: occurrence and distribution of nutrients in the soil, displacement and absorption of nutrients by the roots, nutrient relationships in the soil medium, trace elements, mycorrhiza and tree nutrition.

21.8. *Phenology*

[2368]. 21.8 : 56.02 : 31.1. Ovsyannikov, V. G. K izucheniyu obrazovaniya godichnȳch kolets drevesinȳ. [**Research on the formation of annual rings in wood.**] *Nauchnye Zapiski Voronezhskogo lesokhozyaystvennogo Instituta* Vol. 8, 1941 (35–43). *Abstr.* in *Sovetsk. Bot.* 13 (6), 1945 (47–8). [Russ.] O.B.D.

Microscopic observations were made on wood samples taken every 12 days from 29 local and cultivated tree species in the vicinity of Voronezh. The results showed that it is impossible to judge growth at short intervals on the basis of external stem measurement, e.g. diameter increase was noted in *Pinus sylvestris* 18th April, yet the first rows of tracheids of the new annual ring only on 12th May; for other species the respective dates were—Birch, 30th April and 24th May; Oak, 24th April and 18th May.

In contrast to the findings of previous authors, based on external measurements, only in 4 (*Gleditsia* sp., *Fraxinus excelsior*, a late-flushing form of *Quercus robur*, *Morus* sp.) of the 29 species did the cambium start to form wood before foliation; in a few species these events coincided, but in the great majority the first xylem cells were laid down after the unfolding of the leaves—3–4 days in *Ulmus* sp., *Robinia pseudoacacia*, *Rhus cotinus* and others; 14–16 days in *Quercus*, *Acer platanoides*; and 24–27 (–30) days in *Betula verrucosa*, *Acer tataricum*, *A. dasycarpum*, *Sorbus aucuparia*. Cambium growth ended on 30th July in *Betula*, *Acer pseudoplatanus*, *A. dasycarpum*, *Ulmus pinnato-ramosa*; on 12th August in *Populus tremula*, 'Canadian Poplar', *Aesculus hippocastanum*, *Ulmus* sp., *Phellodendron amurense*, *Acer negundo* and *A. tataricum*; and only in Pine did growth continue till 6th September.

The period of cambial activity was in all species considerably shorter than the total vegetative period. The longest cambial activity was in Pine (3 months, 24 days) followed by *Larix sibirica*, *Acer platanoides*, *Ulmus* sp. *Rhus cotinus*, *Phellodendron amurense*, *Morus alba* (all a little over 3 months), *Acer pseudoplatanus*, *A. tataricum*, *Robinia pseudo-acacia* (2½ months) and shortest in *Betula* and *Acer dasycarpum* (2 months and 6 days).

22. SILVICULTURAL SYSTEMS. FORMS OF STAND

22.1. *High Forest Forms*

[2369]. 22.1 : 56 : 12.26–8 (75.6). Jemison, G. M. **Rehabilitation of defective Appalachian hardwood stands.** *J. For.* 44 (11), 1946 (944–8). [Southeastern Forest Exp. Sta., Asheville, N.C.]

Three methods of rehabilitating depleted and defective Appalachian Mountain hardwood forest stands were tried, beginning in 1930, and compared with a similar untreated stand. Of the three types of cutting (1) 15-in. diameter limit, (2) selection, and (3) clear cutting, the last showed the greatest increase in basal area 14 years later. The selection cutting ranks second in basal-area increment and begins to show marked superiority in quality over the diameter-limit cutting and the control plot. A recent cleaning and thinning of the coppice stand growing on the clear-cut area has yielded 4 cords of firewood per acre at a profit of $17 per acre, and the young stand promises to develop into a healthy and productive condition. *From author's summary.*

[2370]. 22.14.2 : 12.25 (71). Robertson, W. M. **Selection cutting in Pine.** *Silvic. Res. Note Dom. For. Serv.* No. 80, 1946, pp. 6 + tbls.

This study was undertaken to evaluate the effects of selective cutting to crown densities of 80, 40 and 20 per cent. and clear-cutting in strips in a two-aged stand of Jack, White and Red Pine in which the overstorey, mainly consisting of Jack Pine, was overmature. Records were taken on a series of seven permanent sample plots over a period of 6 years. Although the undisturbed stands are heavily stocked, there is still some net increment accruing at the rate of 0·8 per cent. on the poor site and 1·2 per cent. on the better site. Light and

moderate cutting left much mature Jack Pine, in which mortality, probably increased by disturbance, exceeded gross increment. The heavy cutting (essentially a succession cutting, since most of the Jack Pine was removed) resulted in a net increment of 65·0 cu. ft., a rate of 4·5 per cent. The new stand in the clear-cut strips is growing at a rapid rate, but the amount of increment is less than would have been obtained had the immature part of the stand been left. There is ample Pine regeneration on all sites but where crown density is 80 per cent. or more, the seedlings do not survive. It would seem that succession cutting is the most desirable method of treating such two-aged stands. [Cf. *For. Abstr.* 7 (No. 1191)]. *From author's summary.*

[2371]. 22.14.2 : 57.0. ZILLGITT, W. M. **Stand changes following light selection cutting.** *Tech. Note Lake St. For. Exp. Sta.* No. 247, 1946. p. 1.

A stand of mature northern hardwoods in Michigan was given a light selection cut in 1926 and again in 1943. Stand tables were prepared at the time of each cutting. Analysis of the data showed that the general pattern of the stand had not been affected to any great extent by the two cuttings, species ratio remained about constant, and in the 17 years following the first cutting the stand more than regained its initial stocking in basal area as well as in total number of trees.

22.2. *Coppice Forest*

See also *For. Abstr.* 8 (Nos. 2232, 2410, 2473).

[2372]. 22.2 : 12.26–8. **Annual report: Lake States Forest Experiment Station, 1945.** U.S. Forest Service. 1946. pp. 20.

Natural regeneration of Aspen [*Populus tremuloides*] has usually been obtained without difficulty from sucker growth. The increased demand for peeled Aspen pulpwood, which can be produced most economically in spring and summer, has recently led to an extension of summer logging. It is now found that summer-logged areas are not reproducing satisfactorily. They do not put out suckers until the following spring and these are fewer and weaker than those on winter-logged land and also meet with increased competition from brush growth, which gets a start of the suckers. In an attempt to get such an area back into production, the Athens disk plough was tried out on a tract logged 3 years previously. After spring disking the area sprouted vigorously with 5,300 clumps (14,630 stems) per acre, compared with 750 clumps on untreated areas (pp. 11–12).

[2373]. 22.2 : 12.26–8 : 32.24. ZEHNGRAFF, P. J. **Season of cutting affects Aspen sprouting.** *Tech. Note Lake St. For. Exp. Sta.* No. 250, 1946. p. 1.

Cf. preceding abstract.

23. FORMATION OF STANDS

23.1. *Natural Regeneration*

[2374]. 23.1 (71.1) : 60.31. ALLEN, G. S. **Planning for natural regeneration in the Douglas Fir region.** *B.C. Lumberman* 30 (10), 1946 (53–4, 60). [Department of Forestry, Univ. of British Columbia.]

This discussion deals with the possibilities of obtaining more complete natural regeneration at low cost, and especially with the questions of slash disposal, seeding habits and weed competition. It is concluded that the best general method of combining regeneration with protection is to burn the slash in the autumn of a good seed year and thus give seedlings a chance to compete successfully with the weed cover.

[2375]. 23.1 : 12.25 (44) : 21.11 : 11.15. ROUSSEL. La régénération de l'épicéa dans le Haut-Doubs. **[Regeneration of Spruce in the Jura (Dept. of Doubs).]** *Bull. Soc. for. Franche-Comté* 24 (14), 1946 (537–9). [F.]

Following the very abundant seed year of 1942, natural regeneration was very plentiful in Spruce plantations of 30, 40 or 50 years old, from 40,000 to 50,000 seedlings per 100 sq. m. It was observed that, in spite of the well-known intolerance of this species, the quantity of regeneration was more or less uniform throughout the stand though the degree of illumination varied greatly from the edge to the centre. In 1946, the degree of illumination at various points in one of these plantations was measured with a photometer and at the same time the number and size of the 4-year-old Spruce seedlings were noted. Illumination

varied from full light at 10 m. outside the stand to 0·07 at 50 m. inside. The number of seedlings was very few on the outside of the stand, 400–500 per sq. m. at the edge, 400–600 at 15 m. inside, 500–600 at 25 m. and at 35 m. inside the stand, and 400–500 at 50 m. inside. The few plants outside, and those at the edge of the stand, were 9–11 cm. high, branched and vigorous; those at 15 m. inside were 6–7 cm. high and beginning to branch; at 25, 35, and 50 m. inside, they were respectively 5·5–6 cm., 5–5·5 cm. and 4·5–5 cm. high and progressively more chlorotic and filiform. It is concluded from these observations that, while light is not necessary for the establishment of Spruce seedlings and their rapid development during their first year, from the 2nd and 3rd years it is an increasingly necessary factor for their growth. The soil of a young Spruce stand, covered with a thick layer of needles, is often accused of sterility, but is not necessarily injurious to Spruce regeneration, especially on new land, artificially reforested 30–50 years ago. One of the reasons for the non-development of Spruce seed in a forest soil is the frequent presence of seedlings of the same species which, through lack of light, have failed to develop and have died after exhausting or even poisoning the soil. The habitual succession of Fir on such sites, in spite of the much greater quantities of Spruce seed, is sufficiently accounted for by the lack of light, since Fir is very tolerant.

[2376]. 23.1 : 12.25 (71.3 : 71.4). Long, H. D. **Investigation of the factors affecting the regeneration of Spruce in Eastern Canada.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 875 (F–2), 1946. pp. 14.

An investigation was conducted during the 1946 growing season of the factors affecting Spruce regeneration in eastern Canada. The results show that, in general, Spruce regeneration often fails for the following reasons: (1) lack of a source of seed; (2) clear cutting in poor seed years; (3) destruction of seed by birds, rodents, etc.; (4) drought; (5) competition from ground vegetation; (6) destruction by insects and mice; (7) destruction of seedlings by fungi (a very small percentage); (8) mineral nutrient deficiency owing to presence of deep moss or raw humus [cf. *For. Abstr.* 8 (Nos. 1025–6)]. *From author's summary.*

[2377]. 23.1 : 12.25 : 32.29.2. **Annual report: Lake States Forest Experiment Station, 1945.** U.S. Forest Service. 1946. pp. 20.

Slash-disposal experiments in Black Spruce [*Picea mariana*] swamps in 1938 have had interesting results. Where slash was piled, there were 5,520 seedlings of pulpwood species per acre seven years after cutting, and they occupied 95 per cent. of the area. Where slash had been lopped and scattered, there were only 3,200 such seedlings per acre, distributed over 75 per cent. of the area. Where slash had not been treated, there were 3,900 seedlings per acre. Piling and burning was rather less effective than piling alone (4,900 seedlings per acre) (pp. 10–11).

[2378]. 23.1 : 12.25 : 32.29.2. Roe, E. I. **Slash removal an important factor in restocking cut-over Spruce swamps.** *Tech. Note Lake St. For. Exp. Sta.* No. 249, 1946. p. 1.

Cf. preceding abstract.

[2379]. 23.1 : 12.25 : 43 (76.3) : 44.1. Chapman, H. H. **Results of a prescribed fire at Urania, La., on Longleaf Pine land.** *J. For.* 45 (2), 1947 (121–3). [Yale Univ. School of Forestry, New Haven, Conn.]

Report on experiments in prescribed burning on cut-over land in the Longleaf Pine type. It appears that the mortality of seedlings still in the grass from a hot winter fire racing before the wind is negligible, especially when there is a dense stocking of seedlings. At the most vulnerable height, 6 in. to 3 ft., nearly half the seedlings were killed. Under systematic management with full stocking, fires would be kept out of an even-aged Longleaf Pine stand for 3–4 years after the beginning of height growth, by which time the seedlings would have entered the 6- to 12-ft. class, in which mortality was about 20 per cent. What Longleaf Pine needs is full, dense, even-aged stocking from seed, which can be obtained and preserved by fires at 2- to 3-year intervals to control brush and brown-spot disease. Hardwoods too large (2-in. diameter and upwards) to be killed by fire should be cut down in August and, on bare areas, burnt the following August. This month is chosen as the period during which the hardwood sprouts have most fully drawn on stored food in the roots for

growth and have not yet reversed the process of storage on which the vigour of sprouting depends. The area should then be burned again at 2- to 3-year intervals until and after the Pine seed crop restocks the land. Experiments at Urania in controlling Blackjack Oak 30 ft. high and up to 5 in. in diameter have been successful by following this procedure. [Cf. *For. Abstr.* 8 (No. 2703).]

[2380]. 23.1 : 12.26–8 : 38.62 : 33.13 (44). MALLET, J. Futaies de chêne d'Armagnac. [**The Oak woods of Armagnac.**] *Rev. Eaux For.* 84 (12), 1946 (723–9). [F.]

An essential part of the process of producing Armagnac brandies is a period of 2 or 3 years of maturing in the wood. It is considered that, to get the best results, the spirit must be matured in casks made from local Oak trees grown in the open in full sunlight. Coopers choose a tree by cleaving one of its branches; only those whose wood cleaves straight are used. The Oakwoods of the region are managed on a rotation of 100–120 years, with periodical thinnings, and natural regeneration. They consist of about 90 per cent. Oak and 10 per cent. Elm. Until some 40 years ago, Oak regenerated satisfactorily, but the regeneration cuttings are now increasingly invaded by Elm, especially in low-lying areas. This failure of Oak to establish itself is attributed to the neglect of drainage ditches during the past 50 years, with the result that many woods are flooded in the winter, the acorns are washed away or rot, and seedlings are killed. Thorns, briars, etc., choke any surviving seedling Oaks.

23.2. *Artificial Regeneration*

23.22. Preparatory Work. Auxiliary Measures

[2381]. 23.22.1 : 07.7 : 23.13. PABLO. Maskinell markberedning. [**Mechanical ground scarification for regeneration.**] *Skogen* 33 (24), 1946 (369–71). [Sw.]

Brief illustrated description of a tractor-drawn cultivator, for use before natural regeneration or direct sowing, designed by H. Sjöström and consisting of an iron frame on adjustable spring runners and carrying on a central spindle 4 pairs of claws mounted crosswise. The special feature, however, is an automatic release to free the claws if they should jam in any obstacle: there is also a manually-operated release for use in thick brushwood which constitutes a special obstacle. Besides the driver, a man is required to operate the manual release, but this is thought to be an advantage, as in heavy going the two can change jobs at intervals. Test runs of the implement have been promising.

[2382]. 23.22.1 : 12.25 : 22.1 : 44.1 : 12.26–8. WELLNER, C. A. **Recent trends in silvicultural practice on national forests in the Western White Pine type.** *J. For.* 44 (11), 1946 (942–4). [Northern Rocky Mountain Forest and Range Exp. Sta., Missoula, Mont.]

Describes recent changes of policy in the management of the Western White Pine [*Pinus monticola*]. The major trends are (1) greater emphasis on leaving a vigorous growing stock, (2) a change from seed-tree to partial cutting methods, and (3) substitution of a prescribed two-burn for the prescribed single-burn method formerly used to dispose of defective unmerchantable stands. In mature, defective stands the problem is to harvest merchantable material, dispose of defective trees, eliminate *Ribes*, and put the area back into production. This is accomplished by logging all merchantable material, disposing of slash, debris and *Ribes* by prescribed broadcast burning, and then planting with White Pine. The prescribed burning process consists of two operations. The first is a creeper fire which consumes the logging slash and kills most of the defective residual stand. Some *Ribes* seed is destroyed by this fire and the remaining seed is either devitalized or germinates. Three to five years after the first burn, standing material on the area is felled and a second prescribed broadcast burn is made, which consumes most of the light fuels, kills any *Ribes* seedlings and destroys any *Ribes* seeds still remaining in the soil. As few of these prescribed double burns have so far been made, they are still in the experimental stage. The practice of partial cutting raises fresh silvicultural problems, since it favours the more tolerant species such as *Abies grandis* and *Tsuga heterophylla* at the expense of the desired White Pine. [Cf. *For. Abstr.* 8 (Nos. 2392, 2405).]

[2383]. 23.22.2 (54.7) : 97. SIND. **Annual administration report of the Sind Forest Department for the year 1944–45.** Govt. Press, Karachi. 1946. pp. viii + 25.

The conflicting claims of agriculture, fuel production and revenue are discussed, with reference to the practice of inforest cultivation. The general principle is that the annual felled area in a forest grown on short rotation must, to produce maximum returns, be regenerated in the next season, if necessary with the aid of field crops, and for that reason the area which can permissibly be given out for *rabi* cultivation in the riverain zone must be strictly limited to the cut of the previous year. If cultivation is prolonged beyond this period, the first year's seedlings will almost certainly be destroyed by the cultivators and their cattle, along with the root suckers and coppice shoots already on the ground. This restriction will probably reduce the future revenue from inforest cultivation by several lakhs, but in the opinion of the writer of the report, such reduction is necessary in the interests of long-term economy.

A large area of land was let on leases up to 10 years for agri-forestry cultivation on assured water. In most cases results have been rather disappointing. It is now clear that, to carry out such a complicated system of plantation over a period of years, the Forest Department must depend largely on its own efforts. Competitive rates of assessment on lump sum for large areas for long leases are unsound. In their eagerness to secure the lease, tenderers are apt to overlook the probable fluctuations in future market prices of produce. The interest of the long lessee, which is to have the maximum use of the land and irrigation, is bound to conflict with that of the Forest Department, which desires to see the area afforested rapidly. The Agricultural Department has now undertaken to establish Seed Multiplication Farms in certain of these areas and to bear the expenses of canalization, levelling, etc., and to develop the land on agri-silvicultural lines. It is hoped to give out similar areas to syndicates of cultivators for co-operative or collective farming, in which areas for agri-cum-silviculture will be successively released in a regular sequence and the work of levelling, canalization, etc., done gradually over the rotation, at departmental cost, while assessment for cultivation is recovered on the *batai* system (pp. ii–v).

23.23. Sowings

23.23.1. *Seed Procurement, Treatment, and Testing*

See also *For. Abstr.* 8 (No. 2287).

[2384]. 23.23.12 : 07.7. FISCHER. Zur Entwicklung eines neuen Steiggerätes für die Waldsamenernte. [**On the development of a new climbing instrument for forest seed collection.**] *Schweiz. Z. Forstw.* 97 (11), 1946 (518–20). [G.]

The instrument, which is figured, was designed for the safety of the worker and the avoidance of damage to tree trunks. It consists of two independent 'legs', each of which is a vertical lever with a footplate at the bottom of the long (lower) arm, from which the worker's weight is transmitted, via a pivot in the form of a short padded strut bearing on the trunk of the tree, to a steel band attached to the upper (shorter) arm and encircling the tree. The steel band is attached at both of its ends by a thumbscrew and is adjustable to various diameters. Dead branches or clusters of epicormics must be removed when climbing. The instrument has been tested and approved in the instructional forest of the Swiss Federal College and is sponsored by the Swiss Federal Forestry Research Institute.

[2385]. 23.23.13 : 07.7. HALLANDER, Å. Några anteckningar om elektrisk fröklängning. [**Notes on electrical seed extraction.**] *Skogen* 34 (2), 1947 (24). [Sw.]

'*Elektriska fröklängan KKA*'—the portable seed-extractor referred to in *For. Abstr.* 7 (No. 200) was used from March 1st to June 4th, 1946, or 82 working days, with an average of 2 charges per day, dealing with a total of 241 hectolitres of Pine and 15 hl. of Spruce cones. The extraction period varied from 8 to 10 hours according to outside temperature and maturity of cones; the average for 134 charges of Pine cones was 9 hours, using 16 KWH per hl. of cones. The extraction temperatures used were 50° to 52° C. in late winter to spring and 49° for Pine in later spring. Savings of time and power may be made by warming cones at least to room temperature before extraction, for which purpose it might be possible to utilize the warm exhaust from the kiln. On the whole, the apparatus has worked well, costs have been very reasonable, and it is believed that the extractor

has a promising future in the treatment of small lots of more valuable seed (e.g. from élite trees). A plant consisting of 2–3 extractors and 1 simple seed scarifier should have a capacity of 8–12 hl. of cones per 24 hours, or a capacity per season of 1,000–1,500 hl.

[2386]. 23.23.13 : 07.7. BAKER, M. H. **The extraction of tree seed by infra-red lamps.** *Sylva, Toronto* 2 (3), 1946 (25–8).

Experiments were made by the Ontario Department of Lands and Forests Research Division to ascertain the period of time required to open cones by infra-red heating without injury to the seed and the yield of seed per bushel of cones treated, and to determine whether the advantages of the process were such as to warrant the construction of a seed extractor based on this principle. It was found that Red Pine cones could be opened in 4–6 hours compared with 60 hours by the process at present employed; the yield of seed, 15 oz. per bushel of cones, is also considered very satisfactory. A machine has now been constructed at the Southern Research Station, which works on the continuous process principle. Some account of the design and working of the machine is given.

[2387]. 23.23.15 : 12.25 : 23.23.19 (79.4). LANQUIST, K. B. **Tests of seven principal forest tree seeds in Northern California.** *J. For.* 44 (12), 1946 (1063–6). [U.S. Forest Service, San Francisco, Calif.]

This study was conducted principally for the purpose of determining sowing rates for production of nursery seedlings and to test the value of seed stratification for the individual species. The tests were made on seed of *Pinus ponderosa, P. jeffreyi, P. lambertiana, Abies concolor, A. magnifica, Pseudotsuga taxifolia, Libocedrus decurrens.* Germinative capacity of seed is vitally affected by time of cone harvest. The specific gravity of cones is an excellent indication of seed maturity. A suitable test liquid is kerosene or half-and-half kerosene and linseed oil, but any mineral oil or lubricating oil of sp. gr. 0·85 to 0·80 will serve just as well. If sample cones float, the crop is considered ready to pick. The excellent results obtained by stratification attest the value of this method for early spring sowing. Losses from rodents, birds, and adverse weather conditions can be held to a minimum by using stratified seed. It is probably necessary to stratify seed of Fir species and of *P. lambertiana* in order to get successful results in nursery sowings. The detailed results of the tests are given in tabular form.

[2388]. 23.23.15 : 12.26–8 : 23.23.19. ROE, E. I. **Viability of acorns.** *Amer. Nurserym.* 84 (12), 1946 (24–6).

Some Red Oak (*Quercus borealis*) acorns, collected in October 1941, were received at Lake States Forest Experiment Station in April 1942, having been stored in a sack at temperatures averaging 40° to 50° F. They were then divided, and half put into an air-tight tin and half into a burlap sack, and put into a refrigerated seed storage room with temperature maintained at 40° F. Germination was tested in June 1943 and again in March 1945. After 20 months' storage the acorns in the sack showed complete loss of viability while those in the air-tight tin still had an average effective germination of 50 per cent. After 41 months' storage it was found that many of the acorns in the tin had recently sprouted, the proportion being higher towards the bottom of the tin, where there was an accumulation of moisture. Tests on unsprouted acorns showed that germination was still fairly high, ranging from 36 per cent. in the upper part of the tin to 24 per cent. at the bottom, where the acorns were wet and mouldy.

[2389]. 23.23.15 : 12.26–8. JOHNSON, L. P. V. **A practical method of overcoming seed dormancy in *Tilia americana* L.** *For. Chron.* 22 (3), 1946 (182–90).

A method of hastening the germination of Basswood (*Tilia americana*) seeds is described, which involves four phases of treatment: presoaking of the fruit, sulphuric-acid digestion of the pericarp, sulphuric-acid scarification of the testa, and stratification of the seed. The main advantages of this procedure over the Spaeth method (which involves nitric-acid digestion of the pericarp) are that no poisonous fumes are generated, and that the period of excessive heat generation during digestion is greatly reduced, thereby increasing the potential processing output and decreasing the damage to seed viability. The necessary equipment is simple and the output, with 3 experienced men, is 1½–2 bushels per day.

[2390]. 23.23.19 : 12.25. ALLEN, G. S. **Mold-free germination of coniferous seeds.**

J. For. 45 (1), 1947 (51). [Department of Forestry, Univ. of British Columbia.]

Description of a simple procedure for preventing contamination from mould mycelium and bacterial colonies in growing seedlings and germinating seed in laboratory conditions.

23.23.3. *Methods of Sowing*

[2391]. 23.23.3 : 12.25 (75.5 : 75.7). McQuilkin, W. E. **Tests of direct seeding with Pines in the Piedmont region.** *J. agric. Res.* 73 (4), 1946 (113–36). [Appalachian Forest Exp. Sta.] O.R.E.

Tests were made on abandoned farm land in the Piedmont section of South Carolina and Virginia to study: (1) the effects of different treatments on germination and early survival; (2) the suitability for direct sowing of Loblolly, Shortleaf, and Virginia Pines; and (3) costs as compared with planting.

The best treatment tried, all sites considered, was scarification, mulching and screening, but this costs more than planting. On well vegetated average sites, the best of treatments cheaper than planting was scarification and mulching. In preliminary tests, this treatment with Loblolly Pine resulted in 81 per cent. successful spots at the end of the first summer, but in the second series of tests it gave only 46 per cent. successful spots. The major cause of germination failures and mortality after germination was drought.

Although direct sowing may succeed on some sites in some years, none of the methods tested can be recommended as an economic substitute for, or as a large-scale supplement to, planting of Pines in this region.

[2392]. 23.23.3 : 12.25 : 45.12 : 13.2. Helmers, A. E. **Direct seeding Western White Pine—fifth-years results.** *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 44, 1946. pp. 5.

Cf. *For. Abstr.* 8 (Nos. 2382, 2405).

This report summarizes the results of direct sowing experiments with Western White Pine [*Pinus monticola*] after 5 growing years. Initial establishment, experimental methods, and detailed descriptions of the areas have been given in earlier reports [cf. *For. Abstr.* 1 (257), 2 (38, 132), 5 (110)]. These experiments show that reforestation of White Pine by spot sowing can be successful when adequate protection against rodents is provided and the sowing done in the autumn on newly burned north slopes and flats. Poisoning the area with hulled sunflower seeds coated with thallium sulphate, at a rate of 1 lb. per acre, one week before sowing, seems to provide the necessary protection. Although a test of broadcast sowing succeeded better than spot sowing, it is felt that more tests of broadcast sowing are necessary before conclusions can safely be drawn. Spot sowing was successfully accomplished on an administrative scale at about the same cost as that of planting nursery seedling stock.

[2393]. 23.23.3 : 12.25. Helmers, A. E. **Fifth-year results of direct seeding with Western Redcedar and Engelmann Spruce.** *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 42, 1946. pp. 4.

For earlier reports on this project, see *For. Abstr.* 1 (257), 2 (38, 132), 5 (110). It appears from analysis of stocking in the 5th year of the project, that, given a reasonably good site, the principal factors limiting the success of autumn-sown Red Cedar (*Thuja plicata*) are low vegetation and soil. Low vegetation seems to be injurious, not so much through competition for light, space, and moisture as through the smothering of the small and slow-growing Red Cedar seedlings by dead leaves. Soil appears to be important in two ways. Light or sandy soils are too dry for the short-rooted Red Cedar seedlings to maintain a favourable balance between root penetration and soil moisture. Also, light soils tend to be unstable on steep slopes, with a resultant loss of seed spots through both erosion and washing in of soil. Satisfactory stocking has been obtained in two tests of direct sowing of Engelmann Spruce, without rodent protection, on fresh burns.

[2394]. 23.23.3 : 12.26–8 (54.7). Wadhwani, B. B. **Artificial regeneration of Babul (*Acacia arabica*) in Sind.** *Indian For.* 72 (9), 1946 (436).

Brief description of a further method of Babul regeneration known as 'hand pricking'. After the recession of the river floods, a number of men walk in line along areas where broadcast sowings have failed and lightly press 2–3 grains of seed into the ground at intervals of 5 ft., at the same time covering the seed to a depth of

about $\frac{1}{4}$-in. This method is next best to broadcasting and is quicker and cheaper than dibbling. Where hand pricking is not possible owing to the dryness of the ground, small openings may be made with a pointed stick.

[2395]. 23.23.3 : 12.26–8. **Annual report of the Southwestern Forest and Range Experiment Station: calendar year 1945.** U.S. Forest Service. 1946. pp. 33.

Experimental sowing of Cork Oak [*Quercus suber*] made in the woodland type of the southwest United States in 1942 gives the following indications. Best results are obtained by direct sowing of acorns. Abundant light and heat are necessary. Summer sowing has not been successful, chiefly because of the difficulty of keeping acorns viable; cold storage tests have not been successful. Although screening of seed spots to protect acorns from rodents is not always necessary, it is recommended; the partial shade afforded by the screens also helps to conserve soil moisture and check transpiration. Acorns should be placed in the soil lying on the side; if sown with the pointed end down they often fail to shoot. Depth of sowing depends on soil; on heavy clay soils 2–3 in. is deep enough, but in lighter soils 3–6 in. is advisable (pp. 28–30).

23.24. Formation of Stands by Planting

23.24.3. *Spacing*

[2396]. 23.24.3 : 12.25. WARE, L. M., and STAHELIN, R. **How far apart should Pines be planted?** *Sth. Lumberm.* 173 (2177), 1946 (191–3).

Records of experimental plantings of Loblolly, Slash and Longleaf Pine at the Alabama Agricultural Experiment Station point to the following conclusions:—Spacings of 6 × 6, 6 × 8 and 8 × 8 ft. with good survival, and a spacing of 10 × 10 ft. with survival of 90 per cent., will furnish a sufficient number of trees to guarantee a good yield. Where a good pulpwood market is available, the returns from early thinnings pay for the extra cost of 6 × 6 ft. planting. 4 × 4 ft. spacing is too close, leading to overcrowding, and 10 × 10 ft. spacing is too far apart, the faster growth being more than offset by the low quality of lumber produced and the absence of early thinnings. Indications are that Longleaf Pine should be planted slightly closer than Loblolly and Slash Pines.

23.26. Plant Rearing. Nursery Practice

See *For. Abstr.* 8 (Nos. 2243, 2260, 2266–7, 2727).

23.3. *Afforestation*

See also *For. Abstr.* 8 (Nos. 2691, 2695, 2848).

[2397]. 23.3 (41.1–4) : 12.25 : 22.82.1 : 90. GODWIN, G. E. **The functions of the forest.** *Scot. For. J.* 60 (1), 1946 (26–8).

After some generalizations on the function of forest, the writer urges the advantages of pure even-aged stands of conifers for a first rotation when afforesting hill land in Scotland.

[2398]. 23.3 (41.5) : 11.49.5 : 12.25. WITTICH, W. Sur la possibilité d'une afforestation des sols de formation old-red-sandstone en Irlande. [**On the possibility of afforesting soils of old red sandstone formation in Ireland.** *Intersylva* 2 (3), 1942 (321–9). [F.g.e.it.span.]

Soils of the old red sandstone formation are common in Ireland and show a marked degree of podzolization; attempts at afforestation have mostly failed. These soils were formed from the sedimentation of inland lakes and consist mostly of quartz with an extremely low lime content. The moist climate with its cool summers is very unfavourable to the decomposition of vegetable matter, which has caused the development of thick layers of raw humus and peat. The A horizon reaches a depth of about 25 cm., the extremely condensed A/B horizon about 40 cm., followed by 7–10 cm. of extremely compact hardpan. The results of physical and chemical analyses of a typical soil profile are given. Nutrient conditions are unfavourable, but cannot alone be responsible for the complete failure of the Pine plantations. The physical qualities are decisive, as the impermeable A/B and B horizons cause waterlogging after heavy rain. The main task of soil improvement would be to restore the permeability of the soil. The hardpan lies too deep to be broken up and treatment should probably be confined to mixing the upper layers and fertilizing them with lime. This would be feasible where the peat has not been

removed and the hardpan lies deep. *Pinus contorta*, *P. montana*, and perhaps *P. nigra* var. *austriaca*, seem to thrive better in these soils than *P. sylvestris*.

[2399]. 23.3 (44) : 11.48.5 : 12.26–8. 'Marc'. Le terril Solvay. **[The Solvay spoil mound.]** *Rev. Eaux For.* 84 (11), 1946 (679–82). [F.]

The spoil mound in question is formed by the refuse from the chalk quarry of Maxéville near Nancy, one of the largest quarries in the world. It consists of a mass of two or three million cubic metres, the south-eastern face of which, towards Nancy, has reached its definite limits. The Forest Administration was charged with the task of masking this mass of stone with plantations. The task was difficult; the sides of the mound fell away at an angle of 50°; the material varied in size, the smaller being on the surface, while the large blocks were at the foot of the slopes; analysis of the soil showed a calcium content of 88 per cent. in the upper layers and 95·8 per cent. at 3–4 m. from the summit on the north side.

The first plantings were made in 1931–32 with 2,500 Black Pines [*Pinus nigra* var. *austriaca*], 1,300 Acacias [*Robinia pseudoacacia*] and 7,000 Alders [*Alnus incana*]. Survival of the Pines and Acacias was only about 20 per cent. and the survivors were of a chlorotic appearance. The plantings of Alder, on the other hand, were completely successful and made a vigorous annual growth of 50–60 cm. from the second year. Alder continued to be planted in the years 1934–37 with complete success. The ameliorative effect of the Alders on the soil was quickly felt, and those surviving Pines of the 1931 plantings, which had been planted in mixture with Alder, soon began to recover vigour and become established.

The greatest difficulty was experienced on the steep sides of the mound, especially among the large blocks on the lower slopes, one of the problems being the miniature torrents formed by rainwater, which ran down from the flat top of the mound. These were dealt with by small barrages, in order to fix the banks of the torrent beds. In 1940 it was found possible successfully to introduce Black Pine on those parts where the soil had been improved by Alder. Since 1943, numerous herbaceous species and grasses have become established and now form an almost continuous carpet under the trees.

[2400]. 23.3 (56.9) : 11.14.2 : 21.2 : 21.0. Gindel, G. F. **Afforestation of semi-arid and arid areas in Palestine.** *Emp. For. Rev.* 25 (2), 1946 (213–21 + plates). [Agricultural Research Station, Rehovot.]

Afforestation work in Palestine, carried out during the last two decades, penetrates already into areas with 4 in. of yearly rainfall. Initial success could be observed with the following species: *Tamarix* spp., *Zizyphus spina-christi*, and *Pistacia atlantica*. The last-mentioned, scattered from the north to the semi-desert Negeb, is an exceptionally drought-resistant and fast-growing tree.

The introduced *Eucalyptus camaldulensis* [= *E. rostrata*] grows successfully in the arid zone, where deep soil and telluric moisture are available. *Pinus halepensis*, *Casuarina equisetifolia*, *Acacia cyanophylla* and *Parkinsonia aculeata* are other useful exotics in this zone. Initial experiments were successfully carried out by the Forest Research Laboratory, Rehovot, in 1941–45, with *Prosopis juliflora*, *E. gomphocephala*, *E. cladocalyx*, *A. karroo* and others.

The prerequisites of a successful afforestation of such arid areas are: (1) The preparation of suitable stock for planting. (2) Choosing the most suitable season for planting, in order to increase the chances of rooting and initial growth. Plants grown in receptacles should therefore be preferred to those grown in beds. By accelerating the process of germination, more success in direct sowing can be obtained with some species. (3) Hoeing and weeding the soil of newly established plantations. (4) Choice of species with regard to exposure and slope. *From author's summary.*

[2401]. 23.3 (77.1) : 60.2 : 21.0. Chapman, A. G. **Forest planting on strip-mined coal lands with special reference to Ohio.** *Tech. Pap. Cent. St. For. Exp. Sta.* No. 104, 1944. pp. 23 + plates.

It is estimated that about 18,000 acres of land have been stripped for coal in the State, and that as much again will probably be stripped in the future. Forest planting on strip-mined land began about 1920, but only a few of the plantings have been successful. It is suggested that spoil mounds should be considered in 3 main groups on the basis of the geological materials in the overburden: Group 1, spoils of glacial till, sandstones, and acid silt shales;

Group 2, spoils of sandstones and acid silt shales; Group 3, spoils of sandstones, marly shales and limestones. Within each group of spoils, other characteristics, such as proportion of rock present, resistance of rocks to weathering, and composition of rocks, are discussed in relation to time elapsing before they become plantable, and choice of species. On many mounds, a weathering and settling period is essential for the development of a 'soil' sufficiently compact to retain enough moisture for tree survival during dry seasons and to allow time for the leaching of elements toxic to tree seedlings. During the first 8 years after planting in Group 2 spoils, Shortleaf and Pitch Pines grow somewhat better than on adjacent old fields, but are surpassed in growth by Black Locust. Black Locust, which usually stabilizes bank surfaces in 5–8 years and deposits a good litter, is much superior to the tested species of Pine in providing conditions favourable for early hardwood reproduction. For most effective establishment of a hardwood stand on sandstone and acid silt shale spoils, it is recommended that the desired species of hardwoods be mixed with Locust at the time of planting, underplanted in Black Locust before harvesting, or planted in openings at the rate of 200–350 trees per acre immediately after cutting selected Locust trees. Studies made on Group 2 spoils of sandstone and acid silt shales indicate that 300–500 fence posts per acre may be expected from 18-year-old Black Locust plantings, and that some trees reach post size in 8 years. Observations on unsuccessful plantings of Black Locust in Group 3 spoils, where high percentages of clay from marly shales are often found, indicate that, under such conditions, Locust will serve primarily as a nurse crop for other hardwoods. *From author's summary.*

[2402]. 23.3 (81) : 12.26–8. OLIVEIRA, A. P. DE. Azeitoneira. [***Eugenia jambolana*** **(Lam.).**] *Bol. Sec. Agric. Ind. Com., Pernambuco* 13 (3), 1946 (140–2 + plate). [Port.]

Eugenia jambolana is recommended for wider use in afforestation in Brazil mainly on account of its value as a fuelwood, its rapid growth and greater volume production than *Eucalyptus*, and ease of propagation by seed. It can grow satisfactorily on poor, eroded sites. In some places it has been used successfully as a living fence between fields.

23.4. *Formation of Forest by Natural Succession*

See also *For. Abstr.* 8 (Nos. 2326, 2695).

[2403]. 23.4 (67.5) : 12.19.4. RENIER, R. P., S.J. La reforestation naturelle des savanes du Kwilu. [**Natural reforestation of the savannas of Kwilu.**] *Bull. agric. Congo belge* 37 (4), 1946 (801–8). [F.]

Detailed notes on the pioneer species in the savannas of the Kwilu region of the Belgian Congo. Attention is drawn to the unfortunate results of the introduction of *Cassia spectabilis*, which propagates rapidly, destroys pasture, and makes woodland soils unsuitable for cultivation owing to its mass of roots. *Leptoderris congolensis* is considered worth consideration for reforestation; it regenerates freely from seed and also coppices well. *Dalhousia africana* is also recommended. Another good species is that called Mulombe, a species of *Daniellia*; fire exclusion is essential to its establishment.

23.5. *Underplanting*

[2404]. 23.5 (69). MAURITIUS. **Annual report of the Forest Department, 1945.** Govt. Printer, Port Louis. 1946. pp. 13.

In the sample plot of *Pinus taeda* underplanted with tea [cf. *For. Abstr.* 7 (No. 1778)] weights were recorded of leaf removed by plucking. The underwood of tea has the incidental virtue of excluding monkeys (which cause much damage by ring-barking Pine) and checking the three main weeds, *Cordia interrupta*, *Lantana* sp., and *Rubus moluccana* (p. 6).

24. TENDING OF STANDS AND TREES

24.1. *Cleanings*

[2405]. 24.1 : 12.25. WELLNER, C. A. **Improving composition in young Western White Pine stands.** *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 43, 1946. pp. 6.

Cf. *For. Abstr.* 8 (Nos. 2382, 2392).

The results of two tests of cleaning of stands of *Pinus monticola* in northern Idaho, by release from Larch and other competing species. Cleaning was done in 1935 when the stands were about 8 years old. It is concluded that stand composition and density in this type can be controlled most effectively and cheaply by cleanings made during the juvenile stage of the

stand, preferably at about 10 years of age when dominance should be well established. Not only trees of equal or greater height than the White Pine should be cut out, but also trees of lesser height, especially of the intolerant species. A further cleaning, 3–5 years after the first, is desirable so as to maintain the lead of the White Pine. In this way a high proportion of White Pine can be maintained in future stands.

24.2. *Thinnings*

[2406]. 24.2. MULLOY, G. A. **Rules of thumb in thinning.** *J. For.* 44 (10), 1946 (735–7). [Dominion Forest Service, Ottawa.]

A recent article on rules of thumb for thinning [cf. *For. Abstr.* 7 (No. 1190)] suggested to the writer that a comparison between spacing, basal area, and stand-density-index might be useful for the thinning of experimental plots. He presents a graph showing the 200, 250, 300, and 350 stand-density indices as parallel lines on double-logarithmic paper, with various levels of basal area superimposed as broken lines. Two vertical scales are shown—one in number of trees per acre and the other in rectangular spacing such as 7 × 7 ft. or 8 × 8 ft. The horizontal co-ordinate shows diameter in inches. A table is also given, which has been constructed from the graph, to show difference in spacing in feet and average diameter in inches for various stand-density indices.

One of the findings in constructing the graph was that apparently, after the stand has reached its maximum in basal area for the site, and tends to become stationary, it may be difficult to maintain it at the higher stand-density indices. A falling stand-density index will then indicate too great density for optimum growth.

[2407]. 24.2 : 12.25 (410). FLENTJE, W. M., and GOUGH, P. C. **The application of line thinning to the Pine forests of East Anglia.** *Emp. For. Rev.* 25 (2), 1946 (202–12 + plates). [Forestry Commission.]

A new technique of thinning has been developed in the 20-year-old plantations of Scots and Corsican Pine [*Pinus sylvestris* and *P. nigra* var. *calabrica*] established by the Forestry Commission at Thetford Chase in East Anglia. It is known as line thinning, and consists in the removal of one or more lines of trees at regular intervals throughout the plantation. It has certain advantages over normal selective thinning, in that it lessens the costs of selection, felling, and extraction of produce, and also provides access routes for fire protection, but it is only suitable for the first thinning of a series, subsequent thinnings being on a selective basis. The main drawback of line thinning is that it removes a proportion of potential final crop trees. This difficulty has been investigated experimentally, and it is found that, where every third row of trees is removed, the ratio of potential final crop trees to the desirable number may vary from 5·9 : 1 to 1·2 : 1. This ratio is termed the 'selection factor', and its application in deciding the intensity at which line thinning may be carried out, if at all, is discussed. The selection factors found for Corsican Pine were higher than those for the Scots Pine, for two reasons: (1) the number of trees per acre required for the final crop was lower for the Corsican Pine; (2) the Corsican Pine crops were more uniform. The following tentative conclusions on the adoption of line thinning for Pine plantations in East Anglia have been reached: (*a*) In the best Corsican Pine woods, where the selection factor is above 4, a line thinning of the 1-in-3 grade is desirable. (*b*) Where the selection factor falls between 3 and 4, a line thinning on the 1-in-6 grade may be carried out, together with selective thinning in the 5 remaining rows. (*c*) Where the selective factor is between 2 and 3, a line thinning on the 1-in-9 grade is appropriate. (*d*) Where the selection factor falls below 2, line thinning must be regarded, on purely silvicultural grounds, as undesirable. If it is considered desirable in order to provide access routes for fire protection purposes or ease of extraction, then a grade of 1-in-12 may be adopted.

[2408]. 24.2 : 12.25 : 24.51 : 52.3. BICKERSTAFF, A. **Effect of thinning and pruning upon the form of Red Pine.** *Silvic. Res. Note Dom. For. Serv.* No. 81, 1946. pp. 26 + graphs.

In 1940 an experiment was established at the Petawawa Forest Experiment Station to determine whether thinning a 14-year-old plantation from a planted spacing of 7 × 7 ft. to a thinned spacing of 14 × 14 ft., and pruning the trees to a height of 8 ft. would materially influence the

taper of the trees. The results of remeasurement in 1945 indicated that trees in the thinned stand had a definitely greater taper than those in the unthinned stand, with the thinned stand maintaining approximately the same taper while the unthinned stand decreased in taper. Volume increment was significantly greater per tree in the thinned stand. Within a given tree, the greatest stimulation to growth took place in the butt section, where the growth was more than double that in the unthinned stand, and least in the top section, where volume increment was about the same in both thinned and unthinned groups. Pruning had no significant effect upon form though there was a tendency for pruned trees to have less taper in the butt section and a slightly higher form class than the unpruned trees. The results apply only to the 5-year period following treatment and it is probable that the trends will change considerably later in the rotation.

[2409]. 24.2 : 12.25 : 57. WALES, H. B. **Comments on thinning young Red Pine stands.** *J. For.* 44 (12), 1946 (1071–3). [U.S. Forest Service, Milwaukee, Wis.]

The writer joins issue with the suggestion of Schantz-Hansen in a recent paper [cf. *For. Abstr.* 7 (No. 1189)] that Red Pine should be heavily thinned, possibly to a 9 × 9 spacing, at 15 years and then grown to a final crop. He himself advocates light commercial thinning at 10-year intervals in areas where there is a ready market for the material removed. The final volume of material may not be so great, but the whole series of operations will be more economic.

[2410]. 24.2:12.26–8 (54):22.2. SAGREIYA, K. P. **Single stem silviculture (Thinnings in Teak crops of coppice origin).** *Indian For.* 72 (11), 1946 (515–26 + plates).

A method of tending irregular Teak crops of coppice origin is described. The crop is considered ready for the first cleaning-cum-thinning operations when the 'declared' stems have attained a height of 25 to 30 ft. All malformed shoots, interfering shrubs and Bamboo growth are first cut back to facilitate working. The best of the dominant stems are then selected for retention and given the optimum growing space by felling the inferior dominant and dominated stems interfering with their crowns. The theory involved is discussed and the 'thinnings' illustrated with the help of vertical and horizontal cross sections of a typical crop. A thinning regime considered suitable for working plan prescriptions is given. *From author's summary.*

[2411]. 24.2 : 33.53 : 22.88.2. BENNETT, W. A. **Second growth poles.** *W. Cst. Lumberm.* 74 (1), 1947 (102, 104–5).

Report on an experimental cutting in a 5-acre plot of 38-year-old Site III Douglas Fir, made in order to determine whether fire crews can be used satisfactorily in thinning operations. The area has been left with slightly more than 200 trees to the acre, a reduction of about 20 per cent., and it is expected that stumpage revenue from the operation will be $14·00–15·00 per acre.

24.3. *Opening of the Canopy. Release and Improvement Fellings (including Poisoning and Girdling)*

[2412]. 24.3 : 12.25 (77.8) : 56 : 21.64. LIMING, F. G. **Response of planted Shortleaf Pine to overhead release.** *Tech. Pap. Cent. St. For. Exp. Sta.* No. 105, 1946. pp. 20.

A series of studies was initiated in 1938 to ascertain which of 3 methods, 4 intensities, and 5 times of removing overstorey trees would result in the best survival and growth of *Pinus echinata* planted in low-grade stands in the Missouri Ozarks. Survival was significantly affected by only one of the treatments: complete release by cutting after the Pine had grown for 1–2 years under the understorey resulted in an unsatisfactorily low survival. A highly significant increase in height-growth rate was obtained by all releases greater than 33 per cent. There was no significant difference between the growth rates of Pine given 33 per cent. and those given 0 per cent. release. The response in height growth was essentially the same for release by cutting, deep girdling, and shallow girdling. At the end of the third growing season after release, the heights of Pine trees released in March at (*a*) the time of planting, (*b*) 1 year after planting, (*c*) 2 years after planting, averaged 58·0, 52·1, and 48·2 in. respectively. Differences in height-growth rate were still evident during the third year. The growth rate of Pine after delayed release was still more than 5 times that of unreleased Pine. Height-growth rate increased progressively

with increase in intensity of overhead release. Heights of trees given 0, 33, 67, and 100 per cent. releases averaged 16·5, 19·1, 32·8 and 64·7 in. respectively, at the end of the fourth growing season. The fourth-year increment for the same intensities of release averaged 3·3, 3·8, 9·8 and 23·3 in. Thus the differences in heights increased each year and apparently will continue. The increases in growth rate of planted Pine resulting from overhead release were closely correlated with increases in soil moisture. Detailed recommendations are given for planting and release of Pine under hardwoods. *From author's summary.*

[2413]. 24.31 : 12.26–8. ANDERSON, D. A. **Killing undesirable hardwood trees.** A. & M. College, Forest Service, Texas. 1945. pp. 6.

Practical instructions for killing weed trees by cutting, girdling, and poisoning. [Cf. also *For. Abstr.* 8 (Nos. 2477, 2710–1).]

[2414]. 24.31 : 12.26–8 (79.5). HARTMAN, H. J., and OFFORD, H. R. **The eradication of Poison-Oak at Camp Adair, Oregon.** *J. For.* 45 (2), 1947 (105–12). [U.S. Bureau of Entomology and Plant Quarantine.]

A report on the eradication of Poison-Oak (*Rhus diversiloba*) from 1,700 acres at Camp Adair, Ore., during the winter of 1942 and the spring and summer of 1943. Bulldozers equipped with a special brush-rake were used where large plants were found in heavy concentrations. Light infestations were grubbed up with the aid of mattocks and wide-bladed hoes. Pitchforks were used to pile the Poison-Oak brush for burning. Dry borax was then applied to the soil, at a rate of 10–15 lb. per milacre, depending on the size and vigour of the plants removed. A year after treatment there was no visible damage to Oak trees in the hillside areas where heavy dosages of borax had been applied. Further observations will be needed, however, to determine how much soil sterilization has been caused by the borax. *From authors' summary.*

[2415]. 24.31 : 12.26–8 (729.1) : 33.38. CRANE, J. C. **Marabú in Cuba.** *Agric. in Americas* 5 (12), 1945 (227–29, 237).

Eradication of Marabú (*Dichrostachys glomerata*) is a serious problem on agricultural lands in Cuba. Slashing and burning followed by the cultivation of a fast-growing, shade-producing crop such as sugarcane has been the most successful remedy so far used. Marabú has a limited use as a soil improver and for charcoal and in the manufacture of canes and furniture.

[2416]. 24.31 : 12.26–8 (76.4 : 78.9 : 79.1). **Annual report of the Southwestern Forest and Range Experiment Station: calendar year 1945.** U.S. Forest Service. 1946. pp. 33.

The results of a study carried out at Santa Rita Experimental Range show that the elimination of Mesquite occurring in moderate stands (80 trees per acre) is necessary for range improvement. These findings are considered generally applicable to vast semi-desert grassland areas of the Southwest where rainfall is less than 15 in. annually. Where Mesquite infestations are light (fewer than 10 trees per acre) elimination will not result in a marked increase of grass, but is advisable as an insurance against further encroachment. On heavily infested range, removal of Mesquite increased the forage yield nearly three-fold, and it is estimated that this increased yield would liquidate the cost of eradication in 10 years. [Cf. *For. Abstr.* 7 (No. 1786).] (pp. 12–13.)

24.4. *Shelterbelts. Windbreaks*

[2417]. 24.4 (41.1–4) : 23.24. MACDONALD, J. **The planting of shelter-belts.** *Scot. Agric.* 26 (2), 1946 (92–100 + plate). [Forestry Commission.] O.R.E.

Gives practical information on choosing the site and shape of shelterbelts designed either to protect farmhouses and buildings or to shelter arable or grazing land; the choice of species for planting under Scottish conditions; fencing and fire protection; preparation of ground; planting; weeding; beating-up; maintenance of drains; and cleaning and thinning.

In Scotland, the use of broadleaved trees, such as Oak, Ash, Sycamore, Beech, Wych Elm, etc., for shelterbelts is restricted on account of their slow initial growth, although, once established, they make a more permanent shelterbelt than conifers. On the great majority of sites one or more of the following coniferous species is generally used: Scots Pine, European Larch, Japanese Larch, Norway Spruce, Sitka Spruce or Lodgepole Pine (*Pinus*

contorta). The suitability of each is briefly discussed.

The most suitable species for particular types of land are:—Arable land: light and dry, Scots Pine; medium, Norway Spruce, Larches, Scots Pine or broadleaved trees; heavy, Norway Spruce, broadleaved trees. Grassland: moist, Norway Spruce; dry, Scots Pine or Japanese Larch. Bracken: European Larch, Japanese Larch. Peat: Grass/*Juncus*, Norway Spruce; *Molinia*, Norway Spruce, Sitka Spruce; *Molinia*/*Calluna*, Sitka Spruce, *Pinus contorta* in frost hollows. *Calluna*: moorland with thin peat, Scots Pine, Japanese Larch (if not too dry).

A note is added on planting and maintenance grants offered by the State to assist private owners in planting and managing their woodlands for timber production.

2418]. 24.4 (45) : 21.0. PAVARI, A. Windschutzstreifen und Holzartenanbau bei der Urbarmachung des Agro Pontino. **[Shelterbelts and the cultivation of tree species in the reclamation of the Pontine Marshes.]** *Intersylva* 4 (1), 1944 (1–14). [G.g.e.span.f.it.]

A brief historical review. Three types of plantations were made: (*a*) 9–10 m. belts along waterways and on uncultivated land; (*b*) 3-row belts along highways; (*c*) 2-row belts between fields. Fast-growing exotics that proved especially suitable were: *Eucalyptus rostrata*, *resinifera*, *botryoides* and *maideni*, *Cupressus macrocarpa*, *sempervirens*, and *arizonica*, *Pinus insignis* and *pinea*, and *Acacia melanoxylon*. For types (*a*) and (*b*) evergreen, and for type (*c*) deciduous species were preferred. In all, about 500 km. of shelterbelts were planted between 1937 and 1942.

[2419]. 24.4 : 24.2 : 24.5. WALKER, J. **Pruning, thinning and utilizing trees, with special reference to prairie farm shelterbelts.** *Publ. Dep. Agric. Can.* No. 770, 1945. pp. 7.

3. FOREST UTILIZATION. FOREST TECHNOLOGY

31. PROPERTIES AND ANATOMY OF WOOD. WOOD RESEARCH

31.0. *General Information on Woods*

[2420]. 31.0 (67 : 68.9). **Notes on East African timbers.** *Timb. Inform. Timb. Devel. Ass.* Ref. No. 28, 1946. pp. 7.

These notes describe very briefly the principal commercial timbers of East Africa and also include a few of the lesser known species.

[2421]. 31.0 (81) : 31.2. Características físicas e mecânicas de madeiras brasileiras. **[Physical and mechanical properties of Brazilian woods.]** *Brasil madeireiro* 2 (15), 1946 (4–15). [Port.]

Tables showing the physical and mechanical properties of the more important Brazilian timbers arranged in order of decreasing specific weight. Data are included on radial, tangential, and volumetric shrinkage; resistance to axial compression in green and seasoned timber; resistance to static bending in green and seasoned timber; the modulus of elasticity of green timber; and the impact resistance of air-dried timber.

[2422]. 31.0 (81) : 31.2 : 01.2. Características físicas e mecânicas de madeiras brasileiras: [ii] Indice das madeiras estudadas, por ordem alfabética dos seus nomes comerciais. iii. Indice dos nomes vulgares das madeiras estudadas. **[Physical and mechanical properties of Brazilian woods: [ii] Index of the woods studied, arranged alphabetically under their commercial names. iii. Index of the common names of the woods studied.]** *Brasil madeireiro* 2 (16; 17), 1946 (4–13; 4–5). [Port.]

[2423]. 31.0 (83). **Notes on Chilean timbers.** *Timb. Inform. Timb. Devel. Ass.* Ref. No. 29, 1946. pp. 3.

Notes on the principal commercial timbers.

[2424]. 31.0 (932–9) : 12.26–8 : 09.7 : 98.1. STODDARD, C. H. **The forests of the Solomon Islands.** *J. For.* 44 (12), 1946 (1041–3). [Charles Lathrop Pack Forestry Foundation.]

Notes on, and tentative identifications of, some of the more important timbers extracted by the U.S. Marines during the war in the Pacific; these include *Vitex cofassus, Calophyllum* sp., *Albizzia* (*falcata* or *moluccana*), *Mastixiodendron stoddardii, Chrysophyllum roxburghii, Evodia* sp., all of which are good timbers.

[2425]. 31.0 : 04.4 : 12.19. **Map: commercial timbers of the world.** Timber Development Association, 75 Cannon St., London, E.C.4.

Mounted as a wall map showing the areas predominantly under conifers, mixed hardwoods and conifers, temperate hardwoods and tropical hardwoods; and listing the principal timbers by common names.

[2426]. 31.0 : 12.26–8 (8) : 31.1. WEBBER, I. E. **The wood of *Ambelania laxa* Muell. Arg.** *Lilloa* 11 (1), 1945 (49–54 + plates). [E.span.] A.P.B.

Technology of the wood of *Ambelania laxa*, a light-weight species of potential value in the refrigerator, radio and aviation industries.

[2427]. 31.0 : 12.26–8 : 33.8. PATERSON, J. V. **Balsa.** *Wood* 11 (12), 1946 (339–41).

[2428]. 31.0 : 12.26–8. **Specimen woods No. 132: Afara (*Terminalia superba*).** *Wood* 11 (12), 1946 (343–4).

[2429]. 31.0 : 12.26–8. **Sal (*Shorea robusta*).** *Suppl.* to *Wood* 12 (1), 1947 (13–4).

[2430]. 31.0 : 12.26–8. **Specimen woods No. 125: American Red Oak (*Quercus* spp.).** *Suppl.* to *Wood* 11 (5), 1946 (133–4).

[2431]. 31.0 : 12.26–8. **Specimen woods No. 130: East African Mulberry (*Morus lactea*).** *Suppl.* to *Wood* 11 (10), 1946 (283–4).

[2432]. 31.0 : 12.26–8. **The properties of Australian timbers. Shining Gum.** *For. Prod. News Lett. C.S.I.R. Aust.* No. 146, 1946 (4).

[2433]. 31.0 : 12.26–8 (82). [DOMINGUEZ, J. A.] **Zapallo Caspi.** *Trop. Woods* No. 87, 1946 (35).

Description of the wood of *Pisonia zapallo* Griseb., a species of large size and wide distribution recommended for box-making and general building construction. The wood is of

very coarse texture and rather low density, but its nailing characteristics are very good and it is comparatively strong, tough and resistant to splitting.

[2434]. 31.0 : 12.26–8 (82). El palo blanco, una valiosa madera del Norte. [*Calycophyllum multiflorum* **Griseb., a valuable timber from the north of Argentina.**] *Maderil* 19 (4), 1946 (8). [Span.]

Palo Blanco is one of the few species of the subtropical forests of Argentina which occur in pure, more or less compact stands. The tree reaches 20 m. in height and 0·25 to 0·35 m. in diameter.

The wood is fine, uniform, straight-fibred and well adapted for the manufacture of articles requiring great precision such as bobbins, shuttles, aeroplane propellers, carpenters' squares, etc. It makes high-grade plywood which is superior in quality to imported plywood.

31.1. *Structure. Anatomy. Identification*

See also *For. Abstr.* 8 (Nos. 2368, 2445–6, 2467, 2792).

[2435]. 31.1 : 09.2 : 12.14.4. Tippo, O. **The role of wood anatomy in phylogeny.** *Amer. Midl. Nat.* 36 (2), 1946 (362–72). [Department of Botany, Univ. of Illinois, Urbana, Ill.]

The phylogeny of anatomical specialization in stele structures has been established on evidence from 4 main sources: palaeobotany, comparative morphology, ontogeny, and the correlation between evolutionary specialization of the vessel element and reduction in the length of the tracheary cells. These evolutionary trends are not based on any preconceived notions of Angiosperm classification, and instances are cited of specific cases in which anatomical phylogeny of the stele has been of assistance in the classification of families and genera.

Rates of phylogenetic change differ in the various parts of plants, and the development of one structure may be accelerated or retarded in comparison with the evolution of others in the same plant or group of plants; hence in endeavouring to construct a natural system of classification, evidence from all parts of the plant and from all branches of botany must be taken into account. The value of the anatomical method in combination with evidence from related fields has been illustrated very clearly in the works of Bailey, Howard, Smith and Nast.

[2436]. 31.1 : 12.25–9 (82). Cozzo, D. Los generos de fanerogamas argentinas con radios leñosos altos en su leño secundario. [**The genera of Argentine phanerogams with high rays in their secondary wood.**] *Repr.* from *Rev. argent. Agron.* 13 (3), 1946 (207–30). [Span.] X.

Includes a key to 34 genera of Argentine phanerogams possessing high rays, and notes on their anatomical characteristics.

[2437]. 31.1 : 12.26–8. Cozzo, D. La estructura estratificada del leño de *Capparis salicifolia* Gris. [**The stratified structure of the wood of *Capparis salicifolia* Gris.**] *Repr.* from *Ingen. agron.* 6 (3), 1944 (151–3 + plate). [Span.] X.

[2438]. 31.1 : 12.26–8. Yatsenko-Khmelevski, A. A. Izmeneniya v sostave i stroenii drevesinȳ vostochnogo buka (*Fagus orientalis* Lipsky) v zavisimosti ot vozrasta, vȳsotȳ nad pochvoy i vneshnikh uslovi. [**Changes in the constitution and structure of the wood of Oriental Beech with age, height above ground level, and environmental conditions.**] *Repr.* from *Izvestiya Akademii Nauk Armyanskoy SSR.* No. 5, 1946. pp. 16. [Russ.armen.e.] X.

Data (tabulated) on the variation—with height in stem and age of ring—in the length of vessel members, libriform fibres and tracheids in Oriental Beech wood from various parts of Transcaucasia, agree with those reported by R. Hartig for wood of European Beech, as do also the corresponding variations in the numerical ratios of these elements.

The general reaction to unfavourable environmental conditions is a decrease in width of annual rings, accompanied (in adult trees) by a reduction of the late wood (no matter what factor is responsible for the suppression), an increase in number of vessels and hence a decrease in specific gravity. In some cases, however, apparently not correlated with any factor of the external environment, anomalous rings are formed which have equal proportions of early and late wood: this anomalous reaction is characteristic of and recurrent in certain trees,

while others growing under similar conditions show a normal suppression reaction.

There was no clear structural difference between wood of lowland and mountain trees, nor was it possible to distinguish any geographical races on the basis of wood structure in the material studied. All the differences noted were quantitative only.

[2439]. 31.1 : 12.26–8. YATSENKO-KHMELEVSKI, A. A. Stroenie drevesinȳ nekotorȳkh vidov roda *Nothofagus* Bl. v svyazi s polozheniem ego v sisteme. [**The wood structure of some species of the genus *Nothofagus* in connexion with its systematic position.**] *Repr.* from *Dokladȳ Akademii Nauk Armyanskoy SSR.* 2 (4), 1945 (109–13). [Russ. armen.e.] X.

N. betuloides (Argentina), *N. obliqua* (Chile) and *N. cunninghamii* (S. Australia) are rather similar in wood structure (which fits the generic description satisfactorily), but show some important differences from each other, viz.:—*N. cunninghamii* has fibres with distinctly bordered pits, pores mainly solitary and angular, vessel walls often with scalariform pitting; whereas the other two species have pit borders absent or distinguishable with difficulty, pores mostly in groups and chains, and vessel walls very rarely with scalariform pitting. *N. obliqua* differs from *N. betuloides* in showing spiral thickening (absent in the latter and in *N. cunninghamii*) and mainly biseriate heterogeneous rays, 20–25 cells high (mainly uniseriate and 10–15 cells high in *N. betuloides*).

The genus agrees with others of the family in the presence of fibre-tracheids, residual scalariform perforation plates (chiefly in late wood) and abundant tyloses; but, side by side with advanced characters, e.g. vessels in groups or chains, almost complete reduction of pit-bordering, are found more primitive ones, especially the heterogeneous rays, which have almost disappeared in related genera. It is concluded that *Nothofagus* diverged very early from related genera and that the wood of its most primitive representatives probably resembled that of *N. cunninghamii.*

[2440]. 31.1 : 12.26–8 (81). MILANEZ, R. F. Anatomia das principais madeiras brasileiras das 'Rutaceae'. [**Anatomy of the principal Brazilian woods of the Rutaceae.**] *Rodriguésia* 9 (19), 1945 (45–7 + plate). [Port.]

Includes a key to 16 genera and a detailed anatomical description, with photographs of transverse and longitudinal sections (× 50), of the wood of *Dictyoloma incanescens* DC.

31.2. *Physical Properties*

See also *For. Abstr.* 8 (Nos. 2421–2).

31.21. Conductivity

[2441]. 31.21.4 : 31.3. HØJENDAHL, K. **Measurements of dielectric constant and dielectric loss of different wood species: investigation of the dependency on direction, water content, frequency and temperature.** *K. VetHøjsk. Aarsskr.* 1946 (1–32). [E.e.] [Chemical Laboratory, Royal Veterinary and Agricultural College, Copenhagen.]

(i) The dielectric constant at room temperature and at 4 radio wave-lengths, in 15 species of wood, increased considerably with moisture content, was greatest in the axial direction and varied little with wave-length.

(ii) Dielectric loss expressed as a conductivity was measured for the same species, temperature and wave-lengths. Dielectric loss increased with moisture content and was greatest axially: conductivity decreased with wave-length, whereas the loss angle was nearly constant.

(iii) D.c. conductivity, for the same specimens, increased enormously with moisture content. In Spruce wood d.c. conductivity decreases exponentially with the inverse of the absolute temperature.

(iv) Two special cells (the 'clamping' and the 'pneumatic cell') were constructed for measuring variation in dielectric constant and dielectric loss with temperature.

(v) Variation in dielectric constant with temperature was investigated for several species, particularly Teak. Dielectric constant increased almost linearly with temperature in the range − 50° to + 50° C., this being the middle part of the theoretical S-curve. The temperature coefficient increased with moisture content, but very dry wood also had a considerable temperature coefficient.

(vi) A simple formula is derived for the variation of dielectric loss with temperature, based on Debye's theory of the anomalous dispersion and absorption of radio waves in dipole solids, considering, with F. C. Frank, the overturning of the dipole as a chemical

reaction to which Arrhenius' equation is applied, and disregarding as insignificant the temperature variation of some terms.

(vii) This formula is applied to results for several species, particularly Teak, and found valid for dry but not for moist wood.

(viii) The curves are similar to those given by cellulose, and a theoretical explanation is offered according to which the hydroxyl groups of cellulose are the overturning dipoles. This accounts for the remarkable anisotropy of both dielectric constant and dielectric loss. The formula does not apply to moist wood, partly because water dipoles as well as hydroxyl dipoles overturn and partly because ionic conductivity comes in. *From author's summary.*

31.22. Relation to Water, Air, Gases

See also *For. Abstr.* 8 (Nos. 2529, 2638).

[2442]. 31.22.1. DUNLAP, M. E. **Methods used for the measurement of the moisture content of wood.** *Proc. Amer. Soc. Test. Mat.* 45, 1945 (269–74). P.R.

A short summary is given of methods. Oven drying, distillation, electrical and chemical methods, and the use of relative humidity measurements are described, and the degree of accuracy to be expected from each is discussed.

[2443]. 31.22.1 : 07.7. **A new moisture meter.** *Wood* 11 (5), 1946 (150).

Description of a moisture meter developed by the General Electric Company. The meter, which is compact and portable, uses thermionic valves in a circuit specially designed to give extremely accurate determinations of the moisture content of timber. It is claimed that an accuracy of within 2 per cent. can be obtained with any species of timber, and that still more precise measurements can be secured by applying the necessary corrections.

[2444]. 31.22.2. KOEHLER, A. **Longitudinal shrinkage of wood.** *Timber of Canada* 7 (4), 1946 (60–6).

A general review of the subject, with references to published literature.

[2445]. 31.22.2 : 12.25 : 31.1. COCKRELL, R. A. **Influence of fibril angle on longitudinal shrinkage of Ponderosa Pine wood.** *J. For.* 44 (11), 1946 (876–8). [School of Forestry, Univ. of California, Berkeley, Calif.]

In 1943 the writer reported upon the longitudinal shrinkage of Ponderosa Pine wood on drying, in relation to position in cross section of tree and height in stem. The present paper deals with one of the features mentioned, but not elaborated, in the original report, namely, the relation between longitudinal shrinkage and angular orientation of fibrils in the secondary cell wall. The writer describes his experiments and results and concludes that the net longitudinal dimensional change in wood is the resultant of both fibrillar orientation and chain-molecule length, as well as the composite effect of summerwood and springwood.

[2446]. 31.22.2 : 12.26–8 : 31.1. BAUDENDISTEL, M. E., and AKINS, V. **High longitudinal shrinkage and gelatinous fibers in an eccentric Cottonwood log.** *J. For.* 44 (12), 1946 (1053–7). [U.S. Forest Products Laboratory, Madison, Wis.]

A positive correlation between high longitudinal shrinkage and the presence of gelatinous fibres was found as a result of examination of an eccentric log of Cottonwood (*Populus* sp.). Specimens with high longitudinal shrinkage and abundant gelatinous fibres were located along the long radii of the eccentric log, where tension wood might be expected to develop. The shorter radii contained more normal wood with the least longitudinal shrinkage and the fewest gelatinous fibres.

[2447]. 31.22.2 : 33.15.2 : 33.15.3. WEATHERWAX, R. C., and STAMM, A. J. **The coefficients of thermal expansion of wood and wood products.** *Rep. U.S. For. Prod. Lab., Madison* No. R1487, 1946. pp. 24 + tbls. + figs. P.R.

The coefficients of linear thermal expansion of 9 species of wood of varying specific gravity were determined in the three structural directions. Equations were derived for correcting for variations in the slope of the grain. α_u was shown to be independent of specific gravity; α_t and α_r were shown to vary approximately as the first power of the specific gravity.

The coefficients of linear thermal expansion of resin-bonded Birch laminates, both with and without phenolic resin within the cell-wall structure and compressed to various degrees were determined in the three structural directions. Theoretical equations involving the α values for

the wood and for the resin, and the values of the modulus of elasticity in compression for the wood and the resin, were developed, from which the α values for the laminates may be calculated. Empirical equations for the effect of increased specific gravity due to compression were developed, which, when used in conjunction with the resin-content equations, make it possible to calculate the α values for compressed resin-treated wood. The agreement between the calculated and the observed values was good.

Equations were developed for calculating the α values for Birch plywood and cross-banded resin-treated Birch, either uncompressed or compressed. The agreement between the calculated and the observed values was good in the thickness direction, but only qualitative in the sheet direction. This was probably due to shear effects and an edge washboarding effect caused by unbalanced restraint at the ends of the plies.

Data were also obtained for the α values of Douglas Fir, Sitka Spruce, and Sugar Maple impreg and compreg laminates, parallel-laminated and cross-banded papreg, moulded hydrolysed-wood plastic, and hydrolysed-wood sheet laminates.

α = coefficient of linear thermal expansion
$\alpha_u = \alpha$ in fibre direction of solid wood
$\alpha_t = \alpha$ in tangential direction of solid wood
$\alpha_r = \alpha$ in radial direction of solid wood.

Authors' summary.

[2448]. 31.22.3 : 33.36.1. CHRISTENSEN, G. N. **Notes on a method for the study of diffusion of salts through green timber.** *J. Coun. sci. industr. Res. Aust.* 18 (4), 1945 (407–11). P.R.

A method of studying the diffusion of water-soluble chemicals through green timber is described; in this method a disc of green wood is interposed as a 'membrane' between two compartments of a diffusion cell. A possible technique of preparing and using the cell is set out and the advantages and limitations of the apparatus discussed. *Author's summary.*

31.23. Specific Gravity

[2449]. 31.23. PAUL, B. H. **The flotation method of determining the specific gravity of wood.** *Rep. U.S. For. Prod. Lab., Madison* No. 1398 (revised), 1946. pp. 2 + tbl. + fig. P.R.

The specific gravity of wood may be estimated to a reasonably accurate degree by floating a test specimen (1 in. square in cross section and 10 in. long, marked in 10 equal divisions of 1 in.) in water. The wood should be oven-dry, but a formula is given for making a correction in cases where the current moisture content is known. A table gives the average and minimum values of specific gravity and weight for various aircraft woods under different conditions of moisture and the accompanying adjusting contents.

[2450]. 31.23 : 12.25–8 (82). LATZINA, E. Tabla general de pesos especificos de maderas argentinas. **[General table of specific weights of Argentine woods.]** *Bol. Acad. nac. Cienc., Argent.* 36 (2/3), 1943 (230–70). K.

The woods are listed alphabetically under botanical names, with common names, which are also indexed separately. The lightest wood recorded in the 22-page table is that of *Erythrina falcata* (0·177 kg. per cu. dm.) and the heaviest is that of *Schinopsis balansae* (1·305 kg. per cu. dm.) In a supplementary list, the woods are classified by specific weight in 5 groups.

[2451]. 31.23 : 12.25 (68) : 56. TURNBULL, J. M., and PLESSIS, C. P. DU. **Some sidelights on the rate of growth bogey.** *J. S. Afr. For. Ass.* No. 14, 1946 (29–36). [Forest Products Institute, Pretoria.]

In South Africa, Pine stems of certain exotic species, such as *Pinus patula* and *P. radiata*, grow at a phenomenally rapid rate, attaining saw-log size before heartwood has developed over any considerable radius, thus providing for investigation a wider outer zone of wood free of intrusive substances than is offered by the same species from virgin forests. Advantage is being taken of this to determine the radial density gradient and its culminating point in stems of the species of Pine most extensively grown in South Africa. Data obtained from the dissection of 25 thirty-year-old *P. patula* stems, ranging in size from 17 to 21 in. d.b.h. were used to plot curves showing the transverse specific gravity trends of the mean for 25 stems. The technique employed is described in detail. Density at a given height within individual stems is not a function of ring width;

density consistently rises with age, without regard to interruptions in the trend of ring width.

That silviculturally stimulated rates of growth do not result in production of light wood is difficult to demonstrate, on account of difficulty in ensuring comparable site factors in stands established at varying espacements or differentially thinned. However, a very uniform area was found in the Western Province and sample plots were laid out in 1933 in an even-aged stand of *P. radiata* established in 1924 and differentially thinned in 1933 and 1939. In 1944, twenty stems were felled at random in each of 3 plots, and the specific gravities of their entire butt discs were determined. The results, which are given in a table, disclosed a rise in density corresponding with rise in rate of growth. A similar investigation is to be made on material from sample plots of *P. patula* from Natal.

Investigation of individual stems, well differentiated in breast-height diameter, from many Pine stands, has disclosed no significant correlation within a stand between mean specific gravity and diameter.

In view of the foregoing considerations, it seems clear that density is uninfluenced by rate of growth in any of the following circumstances:—

Transversely, within individual stems.
Between differentially espaced stands.
Between stems of varying diameter within individual stands.

The whole misconception regarding the effect of rate of growth on density, at least as far as concerns Pines, arises from the coincidence, under normal silvicultural treatment, of the radial-density and the rate-of-growth patterns, which are causally unrelated.

31.27. Mechanical Strength

See also *For. Abstr.* 8 (No. 2635).

[2452]. 31.27 : 12.25. TURNBULL, J. M. **A note on the reaction of wood in strength to stresses beyond the proportional limit.** *J. S. Afr. For. Ass.* No. 14, 1946 (46–8). [Forest Products Institute, Pretoria West.]

An experiment was undertaken to determine whether wood stressed beyond the proportional limit is actually weakened thereby. Ten clear 30-in. specimens of *Pinus patula*, 2 × 2 in. in cross section, were loaded 3 times up to a deflection of 0·4 in. and a fourth time to destruction; the load at each 0·05-in. interval of deflection up to 0·4 in. for all ten specimens was averaged. The resulting data are given in tables and graphs. The departure from proportionality, while not so large as it was hoped to secure, does represent an excess of 581 lb. or 34 per cent. over that load and is closer to the breaking load than to load at proportional limit. The consistency of the load at 0·4 in. suggests that wood fibres, on being stressed beyond the proportional limit, do not necessarily lose their cohesion.

[2453]. 31.27 : 33.15.2. LISKA, J. A. **The effect of specimen shape on the compressive strength properties of laterally supported plywood specimens.** *Proc. Amer. Soc. Test. Mat.* 45, 1945 (935–42). P.R.

The report gives the results of two series of tests performed at the Forest Products Laboratory, Madison, to compare two forms of hour-glass specimens with prism-shaped specimens. In the principal series of tests, specimens were prepared in a normal manner, but the second series was designed to afford a comparison when the specimens had chipped and frayed ends.

The analysis of tests, made on 200 specimens of two species and three plywood thicknesses and constructions, indicated that, despite a difference in the mode of failure, the physical properties of the well prepared prisms were in agreement with those obtained on the two forms of hour-glass specimens. When the faces of the specimens were chipped and torn, the prism-shaped specimen showed a definite reduction in compressive strength as compared to well prepared specimens of the same type and to those of the hour-glass form. Little, if any, difference, however, in fibre stress at proportional limit or modulus of elasticity was observed between the poorly fabricated prisms and hour-glass-shaped specimens.

In the preparation of prism-type compression specimens, care should be used in fabrication to ensure smooth end surfaces. When specimens are carefully prepared, as the results of this study show, the prism-type specimen afford satisfactory test results. *From author's summary.*

31.3. *Chemical Properties*

See also *For. Abstr.* 8 (Nos. 2462, 2619).

[2454]. 31.3. Bailey, A., and Brooks, H. M. **Electrolytic oxidation of lignin.** *J. Amer. chem. Soc.* 68 (3), 1946 (445–6). D.S.I.R.

Lignin was electrically oxidized and reduced. The yield of oxidation products by this reaction was about double that of any previously known lignin reaction; they were identified as ketones and acids. The experiments are described.

[2455]. 31.3 : 33.3 : 34.6. Erdtman, H. Untersuchungen über schwefelarme Lignin-sulfonsäuren. **[Investigations on incompletely sulphonated lignin-sulphonic acids.]** *Medd. Svenska TräforsknInst.* (*Träkem. och Papperstek.*) No. 2, 1945. pp. 7. [G.e.sw.] *Repr.* from *Svensk PappTidn.* 48, 1945 (75–81). P.R.

[2456]. 31.3 : 33.3 : 34.6. Lange, P. W. Ultraviolettabsorption av fast lignin. **[Ultraviolet absorption of native lignin.]** *Medd. Svenska TräforsknInst.* (*Träkem. och Papperstek.*) No. 5, 1945. pp. 5. [Sw.e.g.] *Repr.* from *Svensk PappTidn.* 48, 1945 (241–5). P.R.

[2457]. 31.3 : 12.25. Erdtman, H. Der Gehalt des Kiefernkernholzes an Pinosylvinphenolen II. Ihre quantitative Trennung und analytische Bestimmung. **[The content of Pine heartwood in pinosylvin phenols, II: Their quantitative separation and analytical determination.]** *Medd. Svenska TräforsknInst.* (*Träkem. och Papperstek.*) No. 4, 1945. pp. 5. [G.e.sw.] *Repr.* from *Svensk PappTidn.* 48, 1945 (217–21). P.R.

Cf. *For. Abstr.* 6 (169).

[2458]. 31.3 : 12.26–8 : 33.32. **Prize for research in wood chemistry.** *Aust. Timb. J.* 12 (7), 1946 (377).

As a result of work in the research laboratory of the Australian Paper Manufacturers Limited, a process was evolved by which cellulose suitable for the manufacture of nitro-cellulose was obtained from alkaline pulp. The process is not readily applicable to Eucalypts, because of the peculiar chemical composition of the hemicellulose constituent, so Pine wood had to be used during the war. Dr. A. Meller, the inventor of the process, is now working on another process, by which he hopes to produce purified cellulose pulps from Eucalypts.

Work has been carried out at the Forest Products Division of the C.S.I.R. on the molecular weight distribution of the carbohydrate fraction of Eucalypt wood. The holocellulose (i.e. the total carbohydrate fraction) of *Eucalyptus regnans* was fractionated by a method employing phosphoric acid. The results indicated that the holocellulose consisted in the main of chains of at least 1,200 sugar units. It was shown further that even mild treatments using dilute alkali resulted in the loss of some of the sugar (xylan) accompanied by considerable breaking down of the cellulose chain. The deduction was made that the xylans are closely associated with, if not actually part of, the cellulose chain.

31.4. *Durability. Decomposition*

[2459]. 31.4 (6) : 33.36.1. Wigg, L. T. **Durability of some East African timbers.** *E. Afr. agric. J.* 12 (2), 1946 (90–100).

31.42. Attack by Plant Organisms

See also *For. Abstr.* 8 (Nos. 2592, 2724).

[2460]. 31.42.11. Theden, G. Vergleichende mikroskopische Untersuchung des im Holz befindlichen Myzels von Bauholz-Pilzen. **[Comparative microscopic investigation of the mycelium of timber-attacking fungi.]** *Hedwigia* 82 (1/2), 1944 (93–8). [G.] K.

The results of observations on *Merulius lacrimans domesticus*, *Coniophora cerebella*, *Lenzites abietina*, *Lentinus lepideus* and *Poria vaporaria* are given, with special reference to the form taken by the division of the cells.

31.43. Attack by Animal Organisms

See also *For. Abstr.* 8 (Nos. 2586–8, 2594).

[2461]. 31.43 : 13.2 (47.4). Brammanis, L. Pflanzenpathologie im Ostland. 5. Mitteilung. Der Hausbock (*Hylotrupes bajulus*) in Lettland. **[Plant pathology in eastern Europe. Part 5. *Hylotrupes bajulus* in Latvia.]** *Z. angew. Ent.* 30, 1944 (372–90). [G.g.] [Institut für Pflanzenkrankheiten der Landwirtschaftlichen Forschungsanstalt für die Generalbezirke Estland, Lettland und Litauen.]

Distribution of *H. bajulus* along the coastal zone of Latvia is conditioned by the mild

maritime climate. As the local houses are built almost entirely of wood and the infestation is concentrated mainly in the planking of the walls of living rooms, chemical remedial measures are practically impossible. Details are given of the precautions required in new constructions based on the design of the building and the use of treated wood.

[2462]. 31.43 : 13.2 : 31.3 : 12.26–8. BECKER, G. Der natürliche Schutz des Laubholzes gegen Hausbockkäferlarven und seine Ursache. **[Natural protection of hardwoods against the larvae of *Hylotrupes bajulus* L. and its cause.]** *Z. angew. Ent.* 30, 1944 (391–417). [G.g.] [Vierjahresplaninstitut für Werkstofforschung beim Staatlichen Materialprüfungsamt Berlin-Dahlem.]

iResults of extensive experiments to deter-m.ne why hardwoods are immune to attack by *H bajulus*. Specific gravity, hardness and other mechanical features are not responsible. Extracts were made with various solvents of Poplar, Alder and Lime wood and added to Pine sapwood. Larvae were fed on these nutritive media and also on the residual hardwoods after treatment with the solvents. Only hardwood treated with caustic soda proved palatable. Other evidence eliminated various wood substances as possible factors conferring immunity on hardwoods. It was concluded that there is a substance specifically poisonous to larvae of *H. bajulus* which can be extracted with caustic soda; it is left to wood chemists to determine its identity.

[2463]. 31.43 : 13.2 : 12.25 : 43.3. MARTINEAU, R. **Studies in fire-killed timber.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Canada* 2 (6), 1946 (1–2).

For several years the Quebec Bureau of Entomology has been studying fire-damaged timber and appraising the damage caused by insects, particularly the black sawyer beetle, *Monochamus scutellatus*. Sample plots established in pure and mixed stands of Spruce, Balsam Fir and Jack Pine indicated the following facts: (1) Borer injury to Spruce and Jack Pine is considerable in areas burned in the spring, while stands burned in August and September show only a trace of damage. (2) Balsam growing in mixture with Spruce and Jack Pine is very lightly affected compared with the other two species. (3) Spruce and Jack Pine of less than 4 in. d.b.h. suffered much less than trees of larger diameter. (4) The average number of tunnels by sq. ft. of bark has been calculated for different sections of the trunk. Wood tunnels are more abundant at the base than in the upper part of the tree. (5) It appears that the insect develops more rapidly in the wood of Jack Pine than in Spruce.

[2464]. 31.43 : 13.2 : 12.25 (944). **Another Cypress Pine borer.** *Tech. Notes For. Comm.* (*Div. Wood Technol.*) *N.S.W.* 1 (11), 1946 (2).

Cypress Pine [*Callitris* spp.] is in general immune to borer attack and hitherto the only borer known to attack it was a species of *Diadoxus* [cf. *For. Abstr.* 4 (131)]. Another borer, apparently an undescribed longicorn, has now been found infesting logs of *C. glauca* in New South Wales.

[2465]. 31.43 : 13.2 (931). KELSEY, J. M. **The influence of termite reproductive castes on the colony and on control measures.** *N.Z. J. Sci. Technol.* 26 (6), 1945 (353–9). P.R.

A summary is made of available information about supplementary reproductive castes in termite colonies. Those interested in termite control should be conversant with the functions of supplementaries and the conditions under which they are developed, otherwise their inspections of termite-infested buildings may cause more harm than good, especially if the inspections be below ground level. There are two main methods of tackling the subterranean termite problem in New Zealand:—

(1) To ignore the possible influence of supplementaries and, on locating an infestation, try to follow the runways back to the vicinity of the nest, treating any termites seen on the way.

(2) To recognize the importance of supplementaries and treat in such a way that there is little likelihood of part of the colony being isolated.

The advantages and disadvantages of each method are fully discussed. *From author's summary.*

[2466]. 31.43 : 13.2 : 12.25–8. WOLCOTT, G. N. **A list of woods arranged according to their resistance to the attack of the West Indian dry-wood termite *Cryptotermes***

–brevis (**Walker**). *Carib. For.* 7 (4), 1946 (329 36). [E.Span.f.]

The information given in the list includes an indication of distribution and percentage of lignin (where this has been determined). Species are classified as very resistant, resistant, susceptible and very susceptible.

31.8. *Quality and Defects of Timber*

See also *For. Abstr.* 8 (Nos. 2451, 2724, 2784–5).

[2467]. 31.8 : 12.25 : 31.1. BURGER, H. **Twisted fibre in tree species. I. Spruce. II. Silver Fir.** [*Mitt. schweiz. Anst. forstl. Versuchsw.* 22, 1941 (142–63).] Translation of summary, by A. L. Griffith. *Indian For.* 72 (11), 1946 (513–4).

Cf. *For. Abstr.* 4 (110).

[2468]. 31.8 : 12.26–8 : 11.47.1. PLANCQUAERT, M., S.J. Communication à propos des pétrifications calcaires du *Chlorophora excelsa*. [**Note on some calcareous petrifactions of *Chlorophora excelsa*.**] *Bull. agric. Congo belge* 37 (3), 1946 (629–41). [F.]

The frequent occurrence of 'stones' of calcium carbonate in the butt logs of *Chlorophora excelsa* is well known [cf. *For. Abstr.* 7 (No. 1257)]. Masses of petrified wood of this species have been found at the Mission of Kingunda in Belgian Congo, some weighing up to 50 kg. The process by which the tree accumulates large quantities of calcium, often in soils poor in that element, is not fully understood. From analysis it is suggested that this material might profitably be used as fertilizer in native husbandry.

[2469]. 31.8 : 12.26–8 : 31.22.2 : 33.8. TIPPO, O., and SPACKMAN, W. **A case history of a shipment of Iroko decking.** *Trop. Woods* No. 87, 1946 (1–11 + plates).

Laboratory tests of shrinkage made on standard, clear, test samples of Iroko [*Chlorophora excelsa*] yield results comparable with those for Teak, but in practice Iroko does not live up to this promise, at least not in such exposed structures as ship decking, because of the large amount of interlocking and steep grain, which leads to excessive longitudinal shrinkage, twisting, bowing, checking, etc. *Authors' summary.*

[2470]. 31.8 : 2 : 56.02. PAUL, B. H. **Steps in the silvicultural control of wood quality.** *J. For.* 44 (11), 1946 (953–8).

Describes the growth patterns, as shown in the ring development of cross sections of broad-leaved and coniferous trees, that will produce wood of uniformly high quality. In hardwoods a well maintained or accelerated growth in diameter gives the best results. Initially wide growth rings with a progressive decrease in ring width, which are common in second-growth stands, yield a highly variable and less desirable product. In softwoods also a rapid initial diameter growth with a progressive deceleration of growth yields a highly variable product, but in a reverse direction from that taking place in hardwoods. A growth pattern recommended for conifers is a medium, uniformly sustained, ring width from the centre outwards. Silvicultural methods of controlling width of growth rings and hence of specific gravity, are suggested.

[2471]. 31.8 : 52.1 : 12.25. BRATTON, A. W. **Hardwoods—the bigger, the better: Hemlocks—just get bigger . . . .** *For. Econ. Note Ntheast. For. Exp. Sta.* No. 2, 1946. pp. [3].

From measurements of the lumber yield of 1,131 hardwood logs and 573 Hemlock logs it was found that, while the value of hardwood lumber increases with log diameter, that of Hemlock (despite greater width and thickness of boards as log size increases) may be nearly constant for all diameters.

32. HARVESTING OF WOOD. LOGGING

See also *For. Abstr.* 8 (Nos. 2492, 2808–10).

[2472]. 32 : 12.26–8. HEDERSTRÖM, T. Om björkens avverkning, transport och lagring. En sammanfattning av finska och svenska erfarenheter på området. [**On the felling, transport and storage of Birch. A summary of Finnish and Swedish experience.**] *Svenska SkogsvFören. Tidskr.* 44 (6), 1946 (462–80). [Sw.]

The crucial point in the utilization of Birch in Sweden is transport and particularly floating, for which the first requirement is to bring and keep the specific gravity low enough to reduce sinking to a minimum. Hederström summarizes and discusses existing Finnish and Swedish data on moisture relations in Birch timber (with special attention to experience on

the rate of drying in stems felled and allowed to season with the foliage intact, in strip-barked timber and in end-coated unbarked logs) and the possibilities of rationalization in felling, transport and storage. He concludes that no generally valid rules are possible and that in each individual case the least expensive method must be worked out to suit conditions, but emphasizes that there is room for a great deal of further research to clarify the effects of the many factors involved.

[2473]. 32 : 22.2 : 07.7. ARNOULET, M. Exploitation des bois de taillis. [**The exploitation of coppice wood.**] *Rev. int. Bois* 31 (112), 1946 (163–7). [F.]

After describing typical operations in harvesting coppice wood with a great expenditure of time and labour, the writer describes a method evolved by the Carburants Forestiers Champenois. The undergrowth is first cut with billhook and piled at intervals in places marked by two small posts, 1 m. apart and ½ m. high. The woodman then proceeds to cut the poles, felling them so that they fall on the heaps mentioned above, with all the butts facing one way. The heaps are then secured by ropes and hauled to the road by a very light horse-drawn vehicle consisting of an axle and two pneumatic-tyred wheels surmounted by a steel frame supporting a perpendicular beam, and with a metal ramp reaching nearly to the ground. The whole apparatus weighs only 120 lb. and is completed by a 10-m. length of rope with a hook at each end. The rope is attached to a bundle of poles and brushwood, passed through a ring on the beam and attached at the other end to the horse, which pulls the bundle up the ramp so that the base is supported on the apparatus, while the twigs trail on the ground. The horse is then harnessed to the vehicle, with the cable rope still attached to it, so that the bundle cannot slip off. One horse can in this way transport 12 bundles (1 m. × 0·5 m.) per day within a radius of 600 m., thus keeping up with the feller. The advantages of the process, in addition to saving of manual labour, are that little or no damage is done to sprouts, and no waste material is left scattered in the woods.

The bundles of poles and brushwood are piled along the roadside, with butts towards the road, and are there dealt with by the 'Super-découpeuse C.F.C.', which consists of a chassis on 4 wheels, supporting a mechanical saw at one end, and a mechanical chopper with revolving blades at the other end, with a motor in the middle. Three men working with this machine can produce per day 5 cu.m. of mining timber, 8 stacked cu.m. of firewood, and 15 stacked cu.m. of chopped-up small wood for charcoal manufacture. Estimated costs and returns are given for a typical operation.

32.2. *Felling and Related Operations*

See also *For. Abstr.* 8 (Nos. 2243, 2822–5).

[2474]. 32.25 : 07.7. En fransk motorsåg. [**A French power saw.**] *Skogen* 34 (4), 1947 (59). [Sw.]

The 'Quick' two-man chain saw for felling and cross-cutting is made (by Etablissements PPK) in 4 sizes with widths of cut from 60 to 125 cm. The two smaller sizes have a 7-h.p. motor and weigh about 40 kg., the two larger use a 9-h.p. motor and weigh about 50 kg. All 4 types can be had with a 5-h.p. electric motor.

In official tests by the French Forest Service, Hornbeam 42 cm. in diameter and at 50 per cent. moisture content was sawn through in 41 secs., Pine of 47 cm. at 60 per cent. moisture content in 30 secs., and Aspen of 40 cm. at 90 per cent. moisture content in 20 secs.

[2475]. 32.25 : 07.7. ZOTOVA, E. V. Mekhanicheskaya prochnost' pil'nykh tsepey. [**Mechanical strength of power-saw chains.**] *Lesnaya Prom.* No.10/12, 1945 (24–7). [Russ.]

Description of steels used for, and mechanical and thermal processing of, chain components (figured) followed by an account of strength tests in which chains not failing at loads below 1,000 kg. were regarded as satisfactory. Of those failing before this load was reached, very few broke at the pins, rather more across the cutting links, but the majority across a particular section of the raker links, which owing to their design are the weakest parts of the chain. Recommendations are made on type of steel and processing necessary to avoid such defects.

[2476]. 32.25 : 07.7 : 07.2. ARO, P. L'étude des scies et ses résultats pratiques dans les pays de l'Europe septentrionale et centrale. [**The study of saws and its practical results in the countries of Northern and Central Europe.**] *Intersylva* 2 (2), 1942 (141–9). [F.g.e.span.it.]

A review, with fairly full bibliography, of the researches which have been undertaken with a view to improving different types of saw in Germany, Switzerland, Russia, Finland and Scandinavia.

[2477]. 32.25.5 : 24.31. HALE, J. D., and MCINTOSH, D. C. **Project 129—Progress report. Report on effect of chemical treatment on the ease of peeling bark from trees felled in November, 1946.** *Mimeo. For. Prod. Lab. Dom. For. Serv.* No. 116, 1946. pp. 9 + [6].

The trees treated in this study were mostly Black Spruce (*Picea mariana*) and Aspen (*Populus tremuloides* and *P. grandidentata*), though a few specimens of Cedar (*Thuja plicata*) and White Birch (*Betula papyrifera*) were also included. The trees were treated by poison girdling in the spring and summer of 1946. Treatments were made with arsenic paste, both alone and in combination with ammonium sulphamate and with sodium chlorate, each of which was also used alone, and with various commercial preparations of 2,4-D. Results are described in detail. It was found that trees of Black Spruce and Aspen treated with soluble arsenic could be peeled when felled in November more easily than normal sap-peeled trees. 2,4-D compounds in very small quantities (as little as 5 g. on an 8-in. Aspen) in some instances gave results in facilitating bark removal about equal to sap-peeling.

32.7. *Loss in Logging. Incidental Waste*

[2478]. 32.7 (79.5 : 79.7). GRANTHAM, J. B. **New standards of forest utilization for the Douglas-Fir region.** *J. For.* 44 (11), 1946 (370–5).

A review of recent studies and experiments in the salvage of waste material by closer utilization, relogging, etc. [Cf. *For. Abstr.* 6 (30), 7 (Nos. 1247, 1990).

32.8. *Grading and Storage of Wood in the Rough*

See also *For. Abstr.* 8 (No. 2629).

[2479]. 32.81 : 33.91 : 33.17 : 12.25. GREGORY, G. R., and PERSON, H. L. **Pine log grades and lumber recovery.** *Sth. Lumberm.* 173 (2177), 1946 (168–9).

The Southern Forest Experiment Station conducted a mill study on the effect of size and quality of logs on milling costs and returns. This article gives the results of that part of the study concerned with the relation between size and quality of logs and grades of lumber produced. It was found that Grade 1 logs produce an average of 83 per cent. Common and Better lumber and 17 per cent. Common and Below, while the corresponding figures for Grade 2 logs are 60 and 40 and for Grade 3 logs, 30 and 70. The inference is drawn that both the lumber industry and forest owners would benefit if logs were to be sold on a graded basis.

32.9. *Transport*

[2480]. 32.9 : 07.7. **Stimson's modern logging: unusual equipment and methods in this Oregon operation.** *W. Cst. Lumberm.* 73 (11), 1946 (64b, 66, 68).

Description of some of the equipment and methods being used in salvage operations in the Tillamook Burn. These include a Lima shovel with a 26-ft. heel boom, and a gravity-swing boom loader, both evolved by the men on the job.

[2481]. 32.91.11 : 13.2 : 32.91.21. RAPPARD, F. W. Olifanten als sleepvee. [**Elephants as draught animals.**] *Tectona* 36 (5), 1946 (274–81). [Du.du.e.]

A review, with chief reference to the possibilities of catching, taming and using elephants in Sumatra.

[2482]. 32.91.12 : 07.7. FOURCHY, P. Un appareil rustique pour débarder les grumes de montagne. [**A rustic apparatus for moving logs in the mountains.**] *Rev. Eaux For.* 84 (12), 1946 (729–33). [F.]

Description of the design and installation of a simple winch, worked by a horse or mule, for hauling logs on to a mountain road when wood is being felled on the steep slopes of a valley with no way of access below.

[2483]. 32.92 : 38.5 : 07.7. WALKER, J. F., BENNETT, W. D., LAMOTHE, G. E., and SILVERSIDES, C. R. **River drive of pulpwood: efficiency of technique. Investigation conducted by the Pulp and Paper Research Institute of Canada and the Woodlands Section, Canadian Pulp and Paper Association, under the direction of A.**

Koroleff. *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 848 (B–9–a), 1946. pp. 256 + index. Price $4.50.

The object of this study was to obtain and compile useful information about river driving of pulpwood in eastern Canada, to bring out the possibilities for improvement and to provide a work of reference on the subject. The investigation was concerned primarily with river driving, both on small streams where high spring water is usually supplemented by water stored in dams, and on larger streams where the wood floats freely without the need of flushing. There are chapters on all aspects of the subject, including the building and location of dams, flumes, sluices, and holding areas; costs; sinkage and floatability of different species and types of log. There is a full bibliography and a number of tables.

[2484]. 32.93.1 : 33.02 (71.3). BURK, A. H., and GRAY, D. W. **Towing pulpwood on Lake Agnew.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 878 (B–9–h), 1947. pp. 7.

Details are given of equipment for towing, performance and costs.

[2485]. 32.95. PONCET, A. L'emploi des câbles en acier dans la vidange des produits des forêts. **[The use of steel cables in harvesting forest products.]** *Rev. Bois Appl.* 1 (7/8), 1946 (13–8). [F.] P.R.

33. CONVERSION AND PRESERVATION OF WOOD

[2486]. 33 (47.0). GAGARIN, E. Le développement de l'industrie russe de transformation du bois. **[The development of the Russian wood-using industry.]** *Intersylva* 2 (2), 1942 (150–71). [F.g.e.it.span.]

The first part of the article gives an account in outline of the general development of Russian forest economy and particularly the wood-using industries. The second part contains statistical data on the distribution, equipment, production, etc., of the Russian wood-making and paper-making industries up to 1937 or 1938.

[2487]. 33 : 12.25–8 (73) : 66. MUELLER, L. A. **Utilization of the secondary species in the Inland Empire.** *J. For.* 44 (11), 1946 (861–5). [Northern Rocky Mountain Forest and Range Exp. Sta., Missoula, Mont.]

The writer holds that the two main commercial species in this area, Ponderosa Pine and White Pine, are being over-cut to a dangerous extent. The annual cut of these species should be reduced and at the same time more use should be made of the secondary species, Western Larch, Rocky Mountain Douglas Fir, Engelmann Spruce, Western Hemlock, *Abies grandis*, Western Red Cedar, Lodgepole Pine, and Black Cottonwood (*Populus trichocarpa*). Present and possible future uses for these species are enumerated.

[2488]. 33 : 12.26–8 (77.4 : 77.5 : 77.6). ZASADA, Z. A., and KLUENDER, W. A. **The future of Aspen in the Lake States.** *Econ. Note Lake St. For. Exp. Sta.* No. 21, 1946. pp. 11.

Recent estimates are that the Aspen (*Populus tremuloides*) type occupies nearly 21 million acres in the states of Minnesota, Wisconsin and Michigan. It is one of the very few species which have increased in volume during the last 10 years; in sawlog value it has increased by 54 per cent. and in pulpwood volume by 66 per cent. The volume of Aspen used in the Lake States for pulp has increased from 3,000 cords or 0·2 per cent. of all species used in 1920 to 439,000 cords or 18·4 per cent. in 1944. Production of Aspen sawtimber has increased from 66·9 million bd. ft. or 5·5 of total sawn timber production in 1941 to 106·9 million bd. ft. or 10·4 per cent. in 1945. The need of improved methods of utilization and of management is stressed.

33.1. *Mechanical Conversion excluding the Manufacture of Mechanical Pulp*

[2489]. 33.1 : 07.7. ROSS, A. P. **Economical handling with straddle and lift trucks.** *Sth. Lumberm.* 173 (2177), 1946 (185–8).

The method of handling unit loads of timber by the straddle truck (which is driven over its load, raises it from the ground, transports it, and deposits it, all mechanically) and the lift truck (which lifts, piles, and loads unit loads of timber by means of forks inserted under the package from either side) are described, and the cost compared with that of other methods of handling. It has been conservatively estimated that either a carrier or a lift truck can do the

work of 10 men and that a single straddle carrier with one operator would readily transport the material formerly handled by at least 2 tractors and 50 or more wagons.

[2490]. 33.1 : 07.7. SEKHAR, A. C. **Equipment for bending wood.** *Timb. Tr. J.* 179 (3668), 1946 (1148–9).

A brief description, with illustrations, of some simple, portable bending machines and frames, designed for use at Curzon Saw Mills, Madras.

[2491]. 33.1 : 07.7. WILSON, W. E. **Jigs and devices for sawing and machining operations used at the Forest Products Research Laboratory.** *Wood* 11 (5), 1946 (126–31).

[2492]. 33.1 : 07.7 (43.1–5) : 32. PETERSON, R. B. **Survey of the German logging, lumber and wood products machinery and equipment industry.** *FIAT Final Rep. Brit. Intell. Obj. Sub-comm.* No. 409, 1945. pp. 63. P.R.

A comprehensive report on machinery used by the German logging and woodworking industry. Machinery for logging, sawing, drying, woodworking, veneer manufacture, etc., is described and illustrated. The following machines and processes only were considered worthy of further investigation:—(1) A 'glueless' method of making core stock; (2) Knothole- and veneer-patching machines; (3) The continuous plywood production method (apparently just in process of development); (4) Plywood-cylinder-making equipment; (5) Gang frame saws designed for small mill use, and other allied sawmill machinery; (6) Special machinery for lead pencils, wood heels, parquetry, wood rulers and similar products.

Use of Wastes

See also *For. Abstr.* 8 (Nos. 2576, 2609, 2623).

[2493]. 33.1 : 34.6. LANSELL, C. V. **An application of sawdust-cement as a flooring material.** *For. Prod. News Lett. C.S.I.R. Aust.* No. 146, 1946 (2).

A short account of the laying of sawdust/Portland-cement flooring on a ship's steel deck over a bitumen emulsion coating. The basal layer was a mix of 3 parts of sawdust, 1 part of cement, ¼ part of lime and 3 per cent. calcium chloride by weight of cement; the surface layer was 2½ parts of sawdust, 1 part sand, 1 part cement with lime and CaCl as before.

[2494]. 33.1 : 34.6. BLAIR, E. A. **Dust explosions.** *Safety Engng.* 90 (6), 1945 (38–9, 42–3). L.S.

The nature of explosions occurring in wood dust, wood flour, wood pulp and sawdust, is described, and recommendations are made for the prevention of such accidents.

[2495]. 33.1 ; 34.6 (71.1). GUERNSEY, F. W. **The utilization of Western Hemlock sawmill waste in British Columbia.** *B.C. Lumberm.* 30 (11), 1946 (49–51, 58).

Studies made at the Forest Products Laboratory, Vancouver, show that during the manufacture of Fir and Hemlock logs into lumber in sawmills of the coast region of British Columbia the following 'waste' is produced for every 1,000 bd. ft. of logs sawn:—

21·1 cu. ft. (0·28 cords) of slabs, edgings and trims.
31·6 cu. ft. (0·4 units) of sawdust (circular headsaw).
23·6 cu. ft. (0·3 units) of sawdust (band headsaw).

In the sawmills of this region, especially those near centres of population, practically all this 'waste' is used in some form such as lath, broom handle squares, fuel wood, hogged fuel and sawdust, pulpwood and pulp chips. The calorific value and methods of drying Hemlock sawdust are discussed and suggestions made for other possible ways of utilizing wood waste.

[2496]. 33.1 : 34.6 : 33.6. **High grade shook from wood waste.** *Timberman* 48 (1), 1946 (38–9, 70).

An account of the Falls Creek Box and Manufacturing Co., of Falls Creek, Oregon, which produces 34,000 orange cases per day, all from broken and defective logs left in the woods or material selected from the waste conveyor of a neighbouring sawmill. The wood is soaked and then cut in a slicing machine.

[2497]. 33.1 : 34.6 : 33.6 : 33.8. **Profitable use of waste cuts.** *Timberman* 48 (1), 1946 (103–4).

Account of the Stockton Box Co. plant at Stockton, California, which manufactures fruit packing cases, making full use of small cuts and knotty shooks that are ordinarily discarded.

[2498]. 33.1 : 34.6 : 33.7. **Briquetting of wood waste: a survey prepared by the Forest Products Laboratory [Madison] of wood waste briquetting and the conditions necessary for successful manufacture and sale of briquets.** *Sth. Lumberm.* 173 (2177), 1946 (274, 276).

33.12. Joinery, Turnery

[2499]. 33.12 : 07.7. HAGGENMÜLLER, H. **Clamping device for woodworking.** *Brit. Patent* No. 578,465, June 28, 1946. *Timber News* 54 (2088), 1946 (380). P.R.

A simple clamping arrangement designed for use by manual woodworkers which provides, by means of a cam cramp, a work table on which the wood can be firmly placed against stop pieces. The cam is actuated by a pivoted spring mounted in the base.

[2500]. 33.12 : 07.7. HAYCOCK, A. H. **Mortising methods. Part 2.** *Wood* 11 (5), 1946 (144–6).

Methods of making and using jigs for hollow-chisel mortising and tapered mortises for use in gang-mortising machines. The operation of single-chain mortisers and gang-mortising machines is discussed.

[2501]. 33.12 : 07.7. HAYCOCK, A. H. **Router forms.** *Wood* 11, 1946 (324–7; 351–4); 12, 1947 (23–7).

[2502]. 33.12 : 07.7. HORDERN, R. H. **Production factors which govern the choice of moulding cutters.** *Timber News* 54 (2089), 1946 (407–8). P.R.

[2503]. 33.12 : 33.8 (410). [LATHAM, R. I.] **Timber in rail stock.** *Timb. Tr. J.* 179 (3669), 1946 (1251–2).

A lecture by the planning engineer of the Carriage and Wagon Works of the L.M.S. Railway at Derby on the uses of wood in the building of railway rolling stock.

33.13. Cooperage. Shingles

See also *For. Abstr.* 8 (Nos. 2380, 2513).

[2504]. 33.13 (73) : 33.36 : 12.25. CLARK, D. **Methods for processing secondary species for wood shingles.** *J. For.* 44 (11), 1946 (878–80). [Washington State Division of Conservation, Seattle, Wash.]

Progress report on a project of the Washington State Division of Conservation, with the object of finding what secondary species could be used as substitutes for the dwindling supplies of Red Cedar in the manufacture of roofing shingles. Experiments were made with Western Hemlock [*Tsuga heterophylla*], Douglas Fir and Silver or White Fir [*Abies amabilis*]. The most effective treatment developed so far is with a combination of urea, dimethylolurea, and a plasticizing agent. Costs of this treatment are low enough to enable White Fir shingles to compete successfully in the markets for better-class roofing materials.

33.15. Manufacture and Use of Veneers and Laminated Wood. Improved Woods. Laminated Materials other than Wood. Glues and Gluing

[2505]. 33.15 (73). **Sixteenth annual plywood review, 1947.** *Timberman* 48 (3), 1947 (37–195).

This number of *Timberman* is devoted almost entirely to a comprehensive review of the United States plywood industry.

33.15.1. *Manufacture of Veneers and Laminated Wood*

[2506]. 33.15.1. MORROW, K. L., and DAVIS, S. J. **Guide for good management-production analysis.** *W. Cst. Lumberm.* 73 (10), 1946 (112a–b).

Sample analysis for cost accounting in plywood manufacture.

[2507]. 33.15.1 [BEATY, J. D.] **Improving plywood quality by better testing methods.** *W. Cst. Lumberm.* 74 (1), 1947 (88, 90–2).

The method of sampling and testing plywood commonly used in the United States is the U.S. Commercial Standard CS 45–45. The sampling procedure there laid down for testing plywood panels involves the virtual destruction of the tested panels, and the Macmillan Industries Limited, Vancouver, B.C., have accordingly developed a method of taking shear samples in such a way that the remaining panel will be one

of standard width and length, and at the same time a representative average of the adhesion in the panel will be obtained. The procedure is explained with the help of a diagram.

[2508]. 33.15.1 (43.1–5) : 07.7. SEBORG, R. M., and FLEISCHER, H. O. **Veneer and plywood manufacturing techniques and machinery observed in Western Germany.** *FIAT Final Rep. Brit. Intell. Obj. Sub-comm.* No. 389, 1945. pp. 42. P.R.

Some points of interest were observed during investigations into the German veneer and plywood manufacturing techniques. Veneer winding equipment often possessed a fairly large winding spool mounted in a moveable dolly, the veneer being wound by electric motor. A new Schuermann clipper with electric feed rolls handled veneer efficiently at a speed of 40 metres per minute. New features of the Siempelkamp veneer driers were the inclusion of a dust and moisture trap in the air circulation system and the lateral arrangement of the return air ducts in order to conserve heat. A small machine designed to flatten distorted veneers was seen at the Blomberger Holzindustrie. The veneer was run between two corrugated rollers so as to 'tenderize' it without actually causing checks, and the veneer thus treated was used as core material. A special scarf-cutting machine was in use for scarfing small pieces of veneer so that they can be end-joined to make them suitable for large panels.

The proper heating of Beech logs to prepare them for veneer cutting was considered very important by plant operators. In all cases the logs were steamed at about 90° C., for an average of perhaps 56 hours.

The scarfing of veneer for aircraft was accomplished by an ingeniously arranged knife which cut the scarf on the end of the log as it revolved on the lathe, before the veneer was peeled. The scarfs cut were at a slope of 1 in 20 and were thought to be entirely satisfactory for aircraft panels.

The foam process of spreading Kaurit urea resin glue gained general acceptance in Germany during the war. The glue is beaten into a foam, so that it takes up about twice its normal volume. Thus, it is claimed, a very thin, uniform glue spread can be obtained. Several formulations are in use, and are given in the report. *From authors' summary.*

[2509]. 33.15.1 (47.1). SMIRNOV, A. V. Fanernaya promȳshlennost' Finlandii. [**The Finnish plywood industry.**] *Lesnaya Prom.* No. 10/12, 1945 (29–32). [Russ.]

A general survey of the Finnish plywood industry, with special reference to the organization and technique of manufacture, and brief notes on Finland's Birch resources, logging practice, and storage and grading of Birch veneer logs. The following are the chief of a number of recommendations for the improvement of the corresponding industry in Russia: (i) Logging of Birch veneer bolts in a wide range of dimensions, and extraction by floating between July 15th and September 15th. (ii) Wide introduction of log storage in natural or artificial ponds; experiments on winter manufacture without hot-water treatment or steaming, but using natural or artificially heated log ponds. (iii) Live rollers to feed logs to the cross-cut saw, and use of a grader at the same stage. (iv) Small peeling machines to utilize small-diameter logs and cores from the larger machines. (v) Grading veneer as soon as it leaves the driers. (vi) Special shops of secure closer utilization, by means of machinery wherever possible, by joining small pieces to veneer; mechanized repair of defects such as knot-holes. (vii) More small presses and the use of mechanical lifters for loading veneers into presses. (viii) Improved transport machinery in factories.

[2510]. 33.15.1 : 12.26–8. FLEISCHER, H. O. **Utilization of Water Oak for veneer.** *Sth. Lumberm.* 173 (2177), 1946 (291–2, 294, 296).

A preliminary report on experiments now in progress at the Forest Products Laboratory, Madison, to determine the suitability of *Quercus nigra* for veneer and plywood. Present indications are that there are no great technical difficulties in the way of such utilization.

[2511]. 33.15.1 : 33.12. SANDERS, H. **The preparation of lumber cores.** *Timber News* 54 (2086; 2089), 1946 (293, 295; 410, 413). P.R.

33.15.2. *Use of Plywood and other Laminated Wood*

See also *For. Abstr.* 8 (Nos. 2447, 2453).

[2512]. 33.15.2 : 07.7 : 33.8. ENGLER, W. P. **Use of plywood in German tooling**

methods; Messerschmitt plants, Regensburg area. *Tech. Intell. Rep. U.S. Strategic Air Forces in Europe* No. P–31, 1945. pp. 8. *Bibliogr. sci. industr. Rep. U.S. Dep. Comm.* 1 (21), 1946 (1232). D.S.I.R.

In tooling the Messerschmitt aircraft, laminated wood was used for stretch-forming dies, large die bases, mock-up structures in solid section, etc. It was also used for minor jig bases, contour bars supporting profiles and end plates in major jigs. Where warping had to be held to a minimum Oboe wood, or a type of plywood manufactured in very thin sheets, was necessary. The method of making dies from this wood is described. There are also descriptions of the forming methods, assembly lines, and of the assembly jigs. Photographs are included.

[2513]. 33.15.2 : 33.13. **Plywood cooperage, a British innovation.** *Mod. Packaging* 20 (2), 1946 (114–5). P.R.

[2514]. 33.15.2 : 33.4 : 31.27. Tyler, D. R. **Elementary principles of stressed skin, plywood panel design.** *Timber News* 54 (2084), 1946 (219–23). P.R.

[2515]. 33.15.2 : 33.4 : 38.2. **The Scottwood house.** *Aero Res. tech. Notes, Bull.* No. 44, 1946. pp. 4. P.R.

A description of the Scottwood design for a prefabricated house, using resin-bonded plywood for floors, walls and roof.

33.15.3. *Improved Woods*

See also *For. Abstr.* 8 (Nos. 2447, 2626).

[2516]. 33.15.3 : 31.2 : 33.15.1. Heath, A. A. **Densified wood laminates, with discussion.** *Trans. Inst. Plastics Ind.* 1945 (32–50). L.S.

Types of plywood and densified wood laminates and methods of making them are explained. The properties of densified wood laminates and their uses are described, with tables giving comparisons with other materials, and curves showing the strength of such laminates as electrical insulating materials in proportion to their thickness.

[2517]. 33.15.3. **Improved woods: the manufacture and characteristics of compressed woods with special reference to 'Permali'.** *Wood* 12 (1), 1947 (10–2).

The impregnated veneers used in the manufacture of Permali 'improved' wood are Beech and Birch, chiefly the former. The strength/weight ratio of the finished product when in tension is 9·3, as compared with 7·7 for steel and 9·0 for Spruce.

[2518]. 33.15.3. Smith, D. N. **Rosin-wax impregnated wood.** *Wood* 11 (11), 1946 (321–2). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

Permeable woods (such as Beech, Hornbeam, Lime, Sycamore and Alder, as well as the sapwood of most species), impregnated with a 60-per-cent. solution of rosin in paraffin wax, machine and turn remarkably well. The rate of moisture absorption is also reduced, and there is a tendency to dimensional stability. Best results are obtained by heavy impregnation, and treated wood may weigh from 55 to 70 lb. per cu. ft. according to the species. At first sight the cost (about 12*s.* 6*d.* per cu. ft. for the impregnant alone) may appear high, but as the treatment does not cause any appreciable change in the dimensions of the wood, it can be applied to finished or semi-finished articles. Impregnation can be effected by orthodox vacuum-pressure methods, and toxic materials or oil-soluble dyes may be added to the solution. The chief and most obvious disadvantage of wood treated with rosin-wax is its high combustibility.

[2519]. 33.15.3 : 31.22.2. Tarkow, H., Stamm, A. J., and Erickson, E. C. O. **Acetylated wood.** *Rep. U.S. For. Prod. Lab., Madison* No. 1593, 1946. pp. 15 + tbls. + figs. P.R.

Experiments at the Forest Products Laboratory, Madison, have resulted in a new method of treating wood with chemical vapours to improve its dimensional stability when exposed to severe and prolonged high humidity or immersed in water over extended periods of time. The method involves treatment with vapours of a solution of acetic anhydride and pyridine, the pyridine being used to swell the wood and the acetic anhydride to replace the relatively hygroscopic hydroxyl groups in the wood with less hygroscopic acetyl groups. The pyridine also catalyses the acetyl anhydride reaction. The acetylation thus accomplished leaves the wood in a permanently swollen condition by means of the bulking action of the

acetyl groups within the cell walls. Acetylation to about 20 per cent. acetyl content reduces shrinkage about 70 per cent. as compared with untreated wood. Limited tests indicate the treatment is permanent. Resistance to decay and shipworms is improved, and a few tests indicate that strength properties are not impaired and may in some cases be improved. *Authors' summary.*

[2520]. 33.15.3 : 33.31. RIDGWAY, W. B., and WALLINGTON, H. T. (to Cotopa Ltd.). **Esterification of wood.** *Brit. Patent* No. 579,255, Dec. 31st, 1943. Brit. Abstr. BI, 1946 (375). P.R.

Wood, particularly in the form of veneer, meal, or moulded shapes, is esterified in such a way as to retain its original fibrous form by treatment with a carboxylic acid, e.g. AcOH (90–75 per cent.), an acid anhydride (I), e.g. Ac_2O (7–20 per cent.), and a multivalent metal halide, e.g. $ZnCl_2$ (3–5 per cent.), preferably in two stages, the latter stage using a higher proportion of (I) and an inert diluent. The product has improved resistance to moisture and is a better insulator.

[2521]. 33.15.3 : 33.8 (43.1–5). LACEY, P. M. C., RUTHERFORD, H. G., POLLARD, G. J. T., and AUSTIN, J. B. **German shuttle block industry.** *Final Rep. Brit. Intell. Obj. Sub-comm.* No. 165, Item No. 31 [1945?]. pp. 12 + figs. P.R.

At the Deutsche Holzveredelung G.m.b.H., Würdinghausen, 'Edelwood' (compressed, solid timber), 'Dehonit' (laminated, phenolic-resin-bonded, compressed wood), and 'Dehofol' (Tego-bonded, uncompressed, laminated wood) were made for shuttles, picking sticks, gear wheels, etc., for the textile industry. The processes and plant are described. For Edelwood Beech was formerly used, but Hornbeam is now more popular. After kiln drying to 11 per cent. moisture content, solid blocks of the timber are pressed between platens on the nominally tangential faces at about 3,500 lb./sq. in. for Beech, or 2,800 lb./sq. in. for Hornbeam at 135° to 140° C., while side pressure is maintained from secondary rams. After 1 to 2 hours of heat, according to the thickness of the block, cooling takes place, pressure being maintained throughout. The wood compresses to a specific gravity of 1·4 for Beech and 1·05 to 1·1 for Hornbeam. Blocks are then conditioned to enable the moisture distribution to even out, and machined. An account of the manufacture of shuttles at the Schmeing factory at Weseke, near Borken, is also given.

At the Holzveredelung G.m.b.H. at Altenberge the same method of manufacturing compressed wood is used, but random laminations of 2 to 3 cm. thickness spread with liquid phenolic resin are also used. Wood is generally Beech, but Oak is also used for decorative effects. Compression for shuttle-block wood is carried out in two stages in two directions. A vacuum seasoning process is in use here, in which wood is subjected to cycles of alternate steaming to 75° C. and evacuation to 2 cm. mercury.

33.15.5. *Glues and Gluing*

[2522]. 33.15.5. KNIGHT, R. A. G. **Requirements and properties of adhesives for wood.** *Bull. For. Prod. Res., Lond.* No. 20, 1946. pp. vi + 26. P.R.

[2523]. 33.15.5. BURNETT, R. S., and PARKER, E. D. **Peanut-meal plywood glue.** *Trans. Amer. Soc. mech. Engrs.* 68 (7), 1946 (751–6). P.R.

Specifications have been developed for peanut-meal which is suitable for use in preparing plywood glue. A glue mixture has been developed which has good flow properties and which is accommodated to ordinary gluing schedules for this type of glue. Joint tests show that the peanut-meal glue meets the requirements established for casein and casein-type glues. *Authors' summary.*

[2524]. 33.15.5. GEISTLICH, E.Söhne A.-G. für chemische Industrie. **Adhesives for waterproof gluing, particularly of cross-ply and veneer wood materials.** *Brit. Patent* No. 570,925, July 30th, 1945. Chem. Abstr. 40, 1946 (6891). P.R.

The adhesive contains animal glue and CH_2O or one of the polymers of CH_2O, and rhodanine as well as, if desired, a silicate of a structure similar to that of bentonite, particularly bentonite, and a liquefying agent, such as $NaClO_4$.

[2525]. 33.15.5. RUDKIN, A. W. [Compiler]. **Synthetic resin adhesives. III. Urea-formaldehyde resins.** *For. Prod. News Lett. C.S.I.R. Aust.* No. 146, 1946 (1–2).

[2526]. 33.15.5. PINTO, E. H. **Synthetic resin cements: the urea-formaldehydes.** *Wood* 11 (11), 1946 (315–7).

Deals with the 'separate-application method' of applying cold-pressing urea-formaldehyde adhesives, its advantages and disadvantages; the melamine-formaldehyde resins, fortified urea cements, resorcinol cements and thermoplastics.

[2527]. 33.15.5. HOFTON, J. **Aminoplastic adhesives.** *Chem. & Ind.* No. 46, 1946 (410–12). P.R.

A summary of the development of urea-formaldehyde and melamine-formaldehyde adhesives, their properties and performance when used for bonding plywood and as constructional cements.

[5228]. 33.15.5. MILLER, D. G. **Practical applications of radio frequency dielectric heating in the furniture industry.** *B.C. Lumberm.* 30 (12), 1946 (87–9, 93–4). [Forest Products Laboratories, Ottawa.]

The writer first deals with the basic principles of dielectric heating and then discusses in some detail its application to the manufacture of curved plywood, assembly gluing, edge gluing of core stock and seasoning.

[2529]. 33.15.5 : 31.22.1 : 07.7. ROBINSON, F. H. **Electronics in industry.** *Elect. Ind.* 46 (11), 1946 (426–9, 433). P.R.

An account of the methods employed in a radio cabinet factory to obtain glue joints by means of radio heating. A description is also given of the Dawe moisture-in-timber meter. Two pairs of needles are pushed into the wood to be tested and the resistance of the wood fibres between the needles is measured by adjusting a potentiometer in the grid circuit of a valve voltmeter to obtain standard deflection on an anode meter.

[2530]. 33.15.5 : 33.15.1. THOMAS, D. P. **Edge-gluing thin veneers.** *W. Cst. Lumberm.* 73 (10), 1946 (74, 112). [Univ. of Washington, Seattle.]

Experiments were carried out at the University of Washington Forest Products Laboratory, using a Mann-Russel radio-frequency generator, and the 'parallel-bonding' principle. It soon became apparent that the principal difficulty in end-gluing veneers was mechanical rather than electronic, for it was observed that stationary glue lines cured almost instantly when placed in a radio-frequency field. The problem to be solved was that of holding the thin veneer edges in accurate register and alignment and under adequate pressure in a horizontal plane, to produce a satisfactory bond. The method, which is described in some detail, consists in passing the veneers through a set of friction conveyor belts into an electrostatic field and thence through a set of discharging slip-friction conveyor belts driven at a slower speed than the in-feed belts and exerting less vertical pressure. This causes the following veneers to crowd the leaders and create horizontal pressure on the glue joint in the electrostatic field, thus bringing the edges into accurate alignment.

[2531]. 33.15.5 : 31.27 : 33.15.1 : 12.26–8. OLSON, W. Z., and BRUCE, H. D. **Strength of joints in Hard Maple blocks, glued with certain resin glues, after various open and closed assembly periods.** *Rep. U.S. For. Prod. Lab., Madison* No. 1542, 1946. pp. 3 + tbl. + figs. P.R.

Hard Maple blocks were glued together with each of 9 commercial resin glues, allowing various periods of open and closed assembly within the range customarily required. This was done at three room temperatures. The joints were cured and conditioned and then tested for strength. The test data were plotted and are set out in the report.

[2532]. 33.15.5 : 33.15.1. TRIGGS, W. W. (to M. and M. Woodworking Company, Portland, Oregon). **Method of making plywood panels.** *Brit. Patent* No. 578,444, June 28th, 1946. *Timber News* 54 (2088), 1946 (380). P.R.

Plywood panels of special lengths are made by splicing together preformed, completed, hot press panels by means of long scarf joints, the scarfed ends of the panels being first coated with glue. If the glue thus applied to the scarfed ends is a thermo-setting glue, it is allowed to dry. The ends of the panels are than placed in overlapping relation and the scarfed joint thus formed is put in a hot press. Heat is transmitted to the glue line from the heated platens of the press through the wood forming the

separate panels to be spliced. The application of heat liquefies the glue, which is forced by the pressure into the pores and cells of the respective panels.

[2533]. 33.15.5 : 33.15.1. I.C.I. LTD. **Process for adhesively joining a plurality of plies to form a laminated structure.** *Brit. Patent* No. 579,701 [n.d.]. *Packaging Abstr.* 3 (11), 1946 (692). P.R.

Laminated structures (e.g. plywood or laminated boards) of high water resistance are produced on laminating machines by (heater or ub) sizing at least one of the plies with a rosin alum size, applying a coating of polyvinyl alcohol solution (preferably with a solids content of 5 to 25 per cent.; 8 to 12 per cent. for boards) to the sized ply, and applying a second ply to the coating of polyvinyl alcohol solution. The process has the additional advantage that it imparts a high initial tack to the polyvinyl alcohol adhesive. The best results are obtained with solid fibreboard when the solution is applied at the rate of about 1 to 6 lb./1,000 sq. ft. of glue line (film thickness 0·00001 to 0·003 in.); for corrugated board the amount applied per 1,000 sq. ft. will be larger.

33.17. Sawmilling

See also *For. Abstr.* 8 (No. 2479).

[2534]. 33.17 (47.0). ZUKOWSKI, A. A. **Problems of the Russian sawmill industry. Mill siting — transport — management — labour.** *Timber News* 54 (2088), 1946 (352–3). P.R.

The possibility of Russia's being able to meet her annual post-war requirements of 45,000,000 cu.m. of sawn timber is discussed. In 1938 Russia's output reached only about 35,000,000 cu.m. A census taken in 1939 showed that there were about 6,500 saw frames in Russia with an annual output capacity of 80,000,000 cu.m., but these for the most part are not situated in areas where vast stocks of timber exist, i.e. in the north of European Russia, Siberia, the Urals and the Far Eastern Provinces. Consequently logs have to be brought by rail to keep up supplies in the depleted areas of the water-catchment zone. Communications are not good, much of the equipment in the northern forest zone is out of date or of poor quality, and the mills are badly run with poor-quality labour. Only 20 per cent. of the country's sawmills belong to the Commissariat for Forest Industry, which has to meet the timber needs of the country. The other 80 per cent. belong to different commissariats needing milled products for the various branches of industry they administer.

[2535]. 33.17 : 07.7. SIMONS, E. N. **Saws and sawing machinery.** Sir Isaac Pitman & Sons Ltd., London. 1946. pp. viii + 224. Price 15*s*. P.R.

A book giving detailed information about saws for all types of material. Circular saws, inserted-tooth saws and bandsaws for wood are among those dealt with and the principles governing their use, methods of manufacturing them and various types of machine in which they are used are described. An appendix deals with methods of reducing danger from circular saws.

[2536]. 33.17 : 07.7. OTTER, J. R. **Circular sawmills—their equipment and operation.** *Sth. Lumberm.* 171 (2147; 2151; 2153), 1945 (63–8, 59–68, 259–66); 172 (2155; 2157; 2159; 2161; 2163; 2165; 2167), 1946 (51–62, 62–70, 57–9, 59–66, 63–72, 59–64, 57–60).

[2537]. 33.17 : 07.7. **A mill that can be scrubbed with a hose.** *Timberman* 48 (1), 1946 (120, 122).

Description of a new sawmill erected at Winito, California by the Harold Casteel Lumber Co. The floor is a single concrete slab, the framework is steel, and the roof is of corrugated aluminium. It is hoped that this building will be practically fireproof. The mill is connected by a 6-in. pipe to the municipal water supply; from two hydrants in the mill water is used with a fire hose to 'sweep' the cement floor each night. The 'sweepings' are washed over the side of the mill into the conveyor trough running to the burner.

[2538]. 33.17 : 07.7. DENTON, J. A. **The way to mechanical efficiency.** *Sth. Lumberm.* 173 (2177), 1946 (135–7).

Describes various devices for use in sawmills and planer mills, especially several scales to be fixed to machinery in order to indicate when the machine is not working accurately. A great saving has been effected at some mills by drying lumber with the bark on and then passing it over a rip saw. Only 38 per cent. of the total then required edging, and an increase

of 8–15 per cent. actual board measure was made over lumber edged in the green state.

[2539]. 33.17 : 07.7. LOTTE, and LAMIAUX. Amenage et force motrice dans les scies à ruban. **[Carriage and driving power for band-saws.]** *Rev. Bois Appl.* 1 (4), 1946 (17–20). [F.] P.R.

[2540]. 33.17 : 07.7. LEHRBAS, M. M. **Recent developments in mills for sawing small logs.** *Sth. Lumberm.* 173 (2177), 1946 (212–4).

An account of the small mobile sawmills which are being used in the Southern Pine region for the economical production of sawn timber from small logs and scattered stands which are unprofitable for the conventional large sawmill.

[2541]. 33.17 : 07.7 (43.1–5). PETERSON, R. B. **Sawmill machinery in Germany.** *Sth. Lumberm.* 173 (2177), 1946 (170–4).

The writer describes the main characteristics of sawmill machining and methods in Germany. The frame saw is almost universal; the small community sawmills are usually horizontal frame saws, often driven by windmills or water wheels; commercial mills almost always use vertical frame gang saws. The usual method of operation of a typical German sawmill with two frame saws is described; the logs are partly sawn, on two sides, in one saw, and the centre cuts are then stacked two, three or four high and passed through the second frame. At least 70 per cent. of the edging operation is eliminated by this method. Output averages about 1,700 bd. ft. of 1-in. planks per hour per frame. American observers were struck by the accuracy of the lumber sawn by this method. At one mill about 200 Fir boards ($1 \times 8 \times 16\frac{1}{2}$ in.) were checked for accuracy by calipering the board at each of the four corners, and less than 1 mm. or $\frac{1}{25}$-in. variation was found.

[2542]. 33.17 : 12.26–8 (71 : 74) : 32.26 : 98.3. KNEELAND, P. D. Le sciage des bois durs et ses problèmes. **[The sawing of hardwoods and its problems.]** *Timber of Canada* 7 (3; 4; 5), 1946 (86–8; 84–5; 82–4).

Cf. *For. Abstr.* 8 (No. 1128).

[2543]. 33.17 : 34.6. PETITPAS, J. Inventaire d'une fortune: les déchets d'une scierie et leur utilisation. **[Evaluation of a fortune: waste from a sawmill and its utilization.]** *Rev. Bois Appl.* 1 (9–10), 1946 (15–8). [F.] P.R.

Graphs are given whereby the following calculations can be made:—(1) the number of planks of a given thickness which can be sawn from a log of given circumference; (2) the surface in square metres of a one-metre length of such a plank; (3) the amount of waste wood in sawdust and rejects which would be obtained from a log of given circumference being sawn into a given number of planks.

33.3. *Chemical Treatment*

Use of Wastes

[2544]. 33.3 : 34.6. BYMAN, L. **Tall oil from the consumer's viewpoint.** *Paper Tr. J.* 123 (22), 1946 (35–40). P.R.

Estimates of tall oil production in the U.S. give an approximate yearly volume of 98,000 tons of crude tall oil of which the greater part is converted to about 40,000 tons of refined tall oil. A total recovery of sulphate-mill tall oils might yield 175,000 tons of crude tall oil annually, giving, with maximum conversion, using present methods, a potential volume of refined tall oil of 130,000 tons per year.

A survey is made of the application of tall oil in the production of soap, textile detergents, degreasing compounds, paints, varnishes, resins, driers, metal-cutting compounds, disinfectants, fungicides, printing inks and emulsifiers, and its position in the market with regard to competitive materials. A comprehensive bibliography is included.

[2545]. 33.3 : 34.6. HESS, M. **Tall oil, its origin, composition, processing and uses in the paint industry.** *Paint Technol.* 11 (128), 1946 (299–304). P.R.

The ample resources available for the production of tall oil products are indicated. A terminology is recommended and explained. The refining and separation processes, and the composition and physical constants of the products, so far as these are known, have been described. Possible substitutes for rosin and drying oils and the application and treatment of these substitutes in the production of paints, varnishes, printing inks, driers, etc., and of synthetic resins, especially of the alkyd and phenolic resin type, are discussed. *From author's summary.*

[2546]. 33.3 : 34.6 : 11.47.1. Aries, R. S. **Lignin as a fertilizer material.** *Paper Tr. J.* 123 (21), 1946 (47–51). P.R.

A summary of recent investigations on the use of lignin in agriculture, conducted under the auspices of the Northeastern Wood Utilization Council. Calcium ligno-sulphonate from sulphite pulping increased the yield of shelled beans by 60 per cent. when applied at the rate of 10 tons per acre. Lignins with surface-active properties, obtained by either acid or alkaline pulping, have increased the infiltration rates of water into the soil up to 100-fold, thereby indicating promise in eliminating erosion and increasing the rain-absorbing capacity of the soil.

Applications of sulphite lignin to soil in pots increased the organic-matter content, pH value, soluble phosphorus, and calcium contents of the soil. It could be used as a substitute for liming materials and part of its cost written off because of its calcium or magnesium content. The prevention of leaching is an added advantage. [See also *For. Abstr.* 7 (No. 1989).] *From author's summary.*

[2547]. 33.3 : 34.6. Lewis, H. F. **The recovery of byproducts from kraft black liquors by the Goodell process.** *Paper Tr. J.* 120 (20), 1945 (45–8). P.R.

The Goodell process is described as a possible means for recovering useful chemical by-products from wood in the kraft process. The process involves the separate drying of the black liquor, destructive distillation of the black liquor solids, use of the non-condensable gases as a source of heat, separation of the aqueous distillate and tar, and further separation of the tar into phenolic oils and neutral compounds. The phenolic oils contain phenol, guaiacol, *o*- and *p*-cresol, creosol, and the higher phenols. The complete separation and purification of these lower constituents is not easy in view of the presence in the crude phenolic oil of many substances which condense readily with phenolic compounds. These lower phenols can be recovered to the extent of approximately 20 to 25 per cent. of the dry tar, and the latter is obtained to the extent of 5·187 per cent. of the black liquor solids. Thus there are produced up to 250 pounds of tar per ton of pulp and up to 50 to 60 pounds of phenols boiling up to 220° C. The cost of separating these products from the crude tar can only be developed from actual operation of the process on a large scale, and the usability of the phenols must be determined by the consumer. *Author's summary.*

[2548]. 33.3 : 34.6. Tomlinson, C. H., and Tomlinson, G. H. (to Howard Smith Paper Mills Ltd.) **Recovery of chemicals and heat from black liquor.** *U.S. Patent* No. 2,406,867, Sept. 3rd, 1946. Chem. Abstr. 40, 1946 (7628). P.R.

Flue gas contains 12–17 per cent. CO_2 and 2–6 per cent. O. The oxidizing effect of the O in the carbonation of black liquor is largely prevented by carrying out the reaction in a spray tower, since the reaction of O with the liquor salts in solution is relatively slow as compared with that of CO_2. The carbonation may be carried out in two steps, with flue gas in the first and pure CO_2 in the second. The quantity of lignin precipitated by CO_2 can be controlled by adjustment of the pH of the liquor. At about 80° the lignin salt precipitated by CO_2 begins to melt and forms a viscous liquid mass. Therefore, the carbonation reaction is carried out at a temperature below that at which melting occurs and, after removing the liquor from the carbonating system, quickly raising the temperature (e.g. to 95°) and separating the liquid lignin salt from the residual black liquor. The liquid mass can be freed from the black liquor impurities by solution in hot H_2O (80° to 95°) and precipitation with H_2SO_4 at a pH of 3–5. The lignin separates as particles of approximately 2–15μ in size and is easily filtered. Lignin thus precipitated is suitable for addition to paper for moulding purposes. A flow sheet illustrates the steps in the process. The residual liquor may be evaporated and burned to recover the Na salts and heat.

[2549]. 33.3 : 34.6. Bergström, H. O. V., and Trobeck, K. G. **Evaporation of black liquor.** *U.S. Patent* No. 2,406,581, Aug. 27th, 1946. Chem. Abstr. 40, 1946 (7628). P.R.

Black liquor is evaporated in two or more steps. The first is carried out in a multiple-effect evaporator to give a product with 50–60 per cent. dry content; in the second step this is increased to 70–80 per cent., a temperature of 110–250° being used; the liquor in this step is circulated over heating surfaces by a pump; in the last step superheated steam is brought into

direct contact with the liquor and the final product (up to 95 per cent. dry content) is solid at room temperature. Prior to or during the evaporation, the liquor is oxidized by air or other oxidizing gases, which prevents the loss of H_2S; this loss can be prevented also by treatment of the black liquor with SO_2 or SO_2-containing gases.

[2550]. 33.3 : 34.6. BERGSTRÖM, H. O. V., TROBECK, K. G., and TYDÉN, H. **Products from sulphite waste lye by fractional precipitation.** *Swed. Patent* No. 115,813, Feb. 12th, 1946. Chem. Abstr. 40, 1946 (6816). P.R.

Sulphite waste lye, from which sulphites have been wholly or in part recovered, is fractionally precipitated by means of oxides or hydroxides of alkali metals, alkaline earth metals, Fe or Al, separately or together, at a temperature not above 75°. Precipitation takes place in stages and is not carried beyond the stage in which almost pure salts of lignosulphonic acid are obtained, but the remaining solution may be treated with further amounts of oxides or hydroxides to precipitate the remaining salts of lignosulphonic acids together with a certain amount of carbohydrates. A still further amount of oxide or hydroxide may then be added to precipitate the carbohydrates. The precipitate containing both lignosulphonic acid salts and carbohydrates may be treated with a dilute solution of the oxide or hydroxide whereby the carbohydrate is dissolved.

[2551]. 33.3 : 34.6. WALKER, R. D., JR., and MORGAN, R. A. **Protein feed from sulphite waste liquor.** *Paper Tr. J.* 123 (6), 1946 (43–7). P.R.

The sugar fraction of Florida sulphite waste liquor may be utilized in the production of *Torula* yeast, a high protein material suitable for cattle feed. This may serve as a valuable adjunct to the already considerable citrus feed industry in Florida.

Pretreatment of the liquor by liming is necessary, otherwise fermentations are slow and yields are low. Inoculum from wort agar slants or actively fermenting sulphite waste liquor is suitable. Approximately 90 per cent. of the reducing sugars is utilized in a 15-hour fermentation cycle and yields of 500 to 700 million yeast cells per millilitre, or up to 5 per cent. by volume, are consistently obtained.

Optimum growth conditions for a laboratory scale batch process using *Torulopsis utilis* var. *thermophilia* are: pH 5·5 to 6·0; aeration = 150 cc. air per minute per litre of sulphite waste liquor (specific for size and shape of fermenter, and air diffuser); nutrients = 2·0 g. $(NH_4)_2$ HPO_4 per litre; temperature = 30° to 35° C. Foaming of the sulphite waste liquor, because of its surface-active properties, was overcome by the use of 0·1 to 0·2 per cent. Turkey red oil, which proved non-toxic to the yeasts whereas other effective anti-foamers were extremely toxic. *Authors' summary.*

[2552]. 33.3 : 34.6. KURTH, E. F., and CHELDELIN, V. H. **Feeding yeasts from wood sugar stillage.** *Industr. Engng. Chem.* (*Industr. Ed.*) 38 (6), 1946 (617–9). P.R.

To explore the suitability of some lesser known yeasts for the utilization of wood sugar wastes, a comparative study was made with *Torula*, *Mycotorula*, and *Hansenula* strains. The three yeasts perform well on still waste liquor from Douglas Fir hydrolysates and in a comparable manner. There is little distinction between their rate of growth, utilization of sugar, yeast yield, and nutritional values. When dried, the yeasts may be expected to furnish a fodder which is an excellent source of protein, amino acids, and B vitamins. In this respect they compare favourably with the best strains of brewer's yeast. Yields of dry yeast ranging from 53 to 63 per cent. on the weight of the sugar consumed have been observed. *Authors' summary.*

33.32. Pulp and Paper Manufacture. Wallboards. Plastics

[2553]. 33.32 (52) : 09.4 : 33.02. **Estimate of the pulpwood situation in Japan.** *Rep. Brit. Intell. Obj. Sub-comm.* No. B.I.O.S./J.A.P./P.R./682, 1946. pp. 10 + xv. P.R.

More than one-half of the total production of pulpwood used in Japan during the ten-year period up to 1945 was concentrated in Karafuto. The loss of this area, coupled with the loss of imports of both pulpwood and wood pulp, considerably reduces the raw material available to the paper industry and other users of pulp. Requirements of remaining pulp mills after bomb damage is repaired and after adequate supplies of other raw materials are obtained,

are estimated to be from 70 to 100 million cu. ft. of wood per year. This requirement is approximately double the average volume of pulpwood cut in Japan proper during the years 1935 to 1945.

A directory and location map of wood pulp mills, together with tables and charts of production and stockpiles, are included. *Author's summary.*

[2554]. 33.32 (71) : 09.4. **Canada's pulp and paper industry establishes new records in 1945: a statistical summary of the pulp and paper industry of Canada for the past year.** *Pulp Paper Mag. Can.* 47 (12), 1946 (82–7, 102).

[2555]. 33.32 (71) : 35 : 98. **Canada's part in wood pulp supply.** *Pulp Paper Mag. Can.* 48 (1), 1947 (56–60).

Total world exports of pulp have fallen by 1½ million tons, or 25 per cent. of the pre-war level. Sweden, Finland and Norway, which formerly provided 74 per cent. of the world's total pulp exports, are now producing 70, 50, and 35 per cent. respectively of their pre-war output. Canadian pulp exports, on the other hand, have increased from about 700,000 to 1,400,000, or about 32 per cent. of estimated current world exports.

[2556]. 33.32 : 12.26–8 (71). SHIPMAN, G. E. **Hardwoods for newsprint: proposed method of stock preparation to use up to 40 per cent. Birch and Poplar in a newsprint sheet.** *Pulp Paper Mag. Can.* 47 (13), 1946 (93–7).

The writer claims that by using 10 per cent. Poplar as groundwood, 60 per cent. Spruce and Balsam as groundwood, and 30 per cent. Birch as semi-bleached kraft pulp, a newsprint sheet can be produced which will probably have better printing qualities than standard newsprint. The cost of production would be about the same per ton as that of standard newsprint.

[2557]. 33.32 : 12.26–8 (75 : 76). BRAY, M. W., and LANG, L. N. **Southern hardwoods for the pulp and paper industry.** *Sth. Lumberm.* 173 (2177), 1946 (215–8).

Information based on the answers to a questionnaire addressed by the Forest Products Laboratory, Madison, to southern pulp mills on the present utilization of hardwoods and the possibilities of increasing their use by improvements in woods and mill practices. Of the 7 million cords of pulpwood used in 1944, some 374,000 cords were hardwoods, made up of 37 per cent. Sweet Gum [*Liquidambar styraciflua*], 9 per cent. Black Tupelo [*Nyssa sylvatica*], 4 per cent. mixed Gum and Oak, 3 per cent. each of Poplar and Willow, and 44 per cent. classified as mixed hardwoods. It is considered that the greatest possibility of increasing the proportion of hardwoods is in the manufacture of kraft pulps and wallboards.

[2558]. 33.32 : 12.26–8. FEOLA, J. A., and LIBBY, C. E. **The suitability of Yellow Birch for glassine paper manufacture.** *Paper Tr. J.* 123 (13), 1946 (64–72). P.R.

Yellow Birch (*Betula lutea*) wood, when cooked by the sulphite process, produces a pulp entirely satisfactory for the manufacture of glassine paper. If glassine papers can withstand a reduction of 15 to 20 per cent. in burst strength, 12 to 15 per cent. reduction in tear strength, and a 5 per cent. reduction in tensile strength, Yellow Birch wood, with its low cost, abundance, high yield, and ease of hydration, should find a wide acceptance in this industry. *Authors' summary.*

33.32.1. *Pulp Manufacture*

See also *For. Abstr.* 8 (Nos. 2544–51).

[2559]. 33.32.1. COLLICUTT, S. A. **Drainage characteristics of groundwood pulp. Studies 1: The constant pressure filtration of groundwood.** *Pulp Paper Mag. Can.* 48 (1), 1947 (66–78).

[2560]. 33.32.1. HARPER, E. A., and EDMONSON, N. V. **An evaluation of indirect versus direct cooking of sulphate pulp.** *Paper Tr. J.* 120 (20), 1945 (39–40). P.R.

The paper presents mill results on both indirect and direct cooking of sulphate pulp over a period of 6 months in each case. They indicate that indirect heating produced more uniform pulp of high strength value. The steam consumption and digester yield appeared to favour direct heating. Steam with superheater for indirect heating is to be avoided as it tends to carbonize the liquor in the heater tubes. *Authors' summary.*

[2561]. 33.32.1. SCHWARTZ, S. L., and BRAY, M. W. **Effect of continuous liquor flow in pulping by the sulphate process.** *Paper Tr. J.* 123 (17), 1946 (42–8). P.R.

Sulphate pulping experiments on Douglas Fir (*Pseudotsuga taxifolia*) and Aspen (*Populus tremuloides*) at the Forest Products Laboratory, Madison, have shown that standard $\frac{5}{8}$-in. chips can be completely reduced to pulp in an extremely short time by allowing pre-heated cooking liquors to flow continuously through a digester charge during the entire cooking period. This procedure reduced the temperature-rise period to approximately 20 minutes, but the pulping rate varied with the type of wood and the concentration, sulphidity, and rate of flow of the cooking liquor. With a concentration of 90 grammes per litre and a maximum temperature of 170° C., Douglas Fir kraft pulp was produced in as short a total cooking period as 35 minutes and bleachable sulphate pulp was produced in 50 minutes. Aspen was pulped even more easily. At a concentration of 45 grammes per litre and a temperature of 170° C., a 50 per cent. yield of easy-bleaching sulphate pulp of relatively high alpha-cellulose content (88·6 per cent.) was obtained from Aspen in 35 minutes' total cooking time. A reduction in sulphidity from 33·9 to 10·2 per cent. in the cooking liquor reduced its lignin-removal efficiency, but this effect was more noticeable with Douglas Fir than with Aspen. The reduction in the rate of liquor flow also reduced the pulping rate.

Since the maximum digestion temperature is attained in experimental digestions in 15 to 20 minutes, and since the concentration of chemicals in the cooking liquor remains practically constant throughout the digestion period, the pulping of the wood chips is performed in a shorter time than is consumed in the customary batch process. Further, the large volume of liquor passing through the digester causes a rapid removal of soluble lignin reaction products and pulp-discolouring substances from the sphere of reaction. Lighter coloured unbleached pulps of easier-bleaching characteristics and lower pentosan and higher alpha-cellulose contents than those obtained by ordinary sulphate-pulping methods result.

The cooking time could be further reduced by the use of higher temperatures, concentrations, and rates of flow than those given. While the use of a continuous flow of liquors in pulping indicated means for reducing cooking time and for producing pulps of higher purity with respect to alpha-cellulose, pentosan contents and bleachability than present commercial methods, its practical application largely depends upon utilization of active chemicals remaining in the cooking liquor after passing through the digester. *Authors' summary.*

[2562]. 33.32.1 : 12.25. MELLER, A. **The hot alkaline purification of cellulose. II. Cooking of Pine wood by the sulphate process in one and two stages, and hot alkaline purification of Pine sulphate pulp.** *Paper Tr. J.* 123 (26), 1946 (49–54). P.R.

Pine wood chips were pulped by the sulphate process in a single stage, applying relatively high alkali charges on the weight of wood and relatively low temperatures (pressures). The pulps obtained showed pentosan contents of 4·5 to 5·5 per cent., alpha-cellulose contents of 91 to 92 per cent., and solution viscosities in cuprammonium of 1 to 15 poises.

Pulps were also produced by a two-stage sulphate process, applying in the first cooking stage relatively high alkali charges, at relatively low pressure. This first-stage pulping was interrupted, the greater part of the black liquor drained off, replaced by white liquor and a second cooking performed. The resultant pulps contained 3 to 4 per cent. pentosans, 91 to 93 per cent. alpha-cellulose and their solution viscosity in cuprammonium was about 2 poises.

Finally, Pine wood chips were pulped by the sulphate process as referred to above and, after removing the black liquor and washing the pulps free of alkali, they were subjected to a second sulphate cooking. The pulps obtained had 2 to 3 per cent. pentosans, 93 to 94 per cent. alpha-cellulose, and solution viscosities of about 1 poise.

It is concluded that by applying a two-stage sulphate process on Pine wood, pulps of high purity can be produced with the use of the customary digesters for sulphate pulping. *Author's summary.*

[2563]. 33.32.1 : 07.7 : 32.25.5 : 07.7. **New developments in the sulphite industry.** *Pulp Paper Mag. Can.* 48 (1), 1947 (79–84).

A report compiled by the 1946 Sulphite Committee of the Technical Section, Canadian Pulp

and Paper Association. An important line of development is that of barking methods, and some account is given of a number of new barkers. Other subjects reviewed are acid plant design and operation, cooking practices, pulp washing, screen rooms, drying, and bleaching. References are given to published accounts of most of the methods and equipment cited.

[2564]. 33.32.1. BERNHEIMER, N. **Comments on yield in the manufacture of sulphite pulp.** *Pulp Paper Mag. Can.* 47 (11), 1946 (99–102).

Notes by the former owner of a German pulp and paper mill which, during the period 1914–38 showed a steady increase in yield, at lower cost, without loss of pulp quality. A fairly detailed description is given of the whole process employed, great stress being laid on the preparation of the wood and the need for the closest co-operation between the chief chemist, the chief engineer, the heads of the maintenance and power departments, and the superintendents of the pulp mill and the paper mill.

[2565]. 33.32.1. RANHAGEN, E. G. R. **Removal of resins from sulphite pulp.** *Swed. Patent* No. 115,971, Mar. 5th, 1946. Chem. Abstr. 40, 1946 (6816). P.R.

Sulphite-pulp mass into which alkali and air have been introduced is subjected to a rotatory or whirling motion in a cyclone apparatus so that the separated resins and air form a scum around the axis of rotation, which is removed by suitable means. Apparatus is described.

[2566]. 33.32.1 (43.1–5). MCGOVERN, J. N. **Manufacture of high alpha pulps in wartime Germany.** *Paper Ind.* 28 (7), 1946 (988–90). P.R.

[2567]. 33.32.1 (43.1–5). SHELDON, L. M. **Aschaffenburger Zellstoffwerke A.G.** *Rep. comb. Intell. Obj. Sub-comm.* No. xxvi–34, Item No. 22 [1945?]. pp. 7. P.R.

An account of the methods used by the Stockstadt pulp plant of the Aschaffenburger Zellstoffwerke A.G., which prepared high-quality pulp for a crêpe paper product used for the manufacture of nitro-celluloses. After digestion the pulp was washed and screened in the normal fashion and subjected to a purification treatment which involved a direct chlorination step, a two-stage hypochlorite bleaching treatment and a final treatment with dilute hydrochloric acid for reducing the ash content and dissolving out the undesirable calcium salts. The high quality of the product is thought to be due to a careful control of viscosity, a procedure for drying which involved exposure to temperatures not greater than 90° to 92° C. while reducing the moisture content from about 30 per cent. to 7 per cent., the final dilute-hydrochloric-acid treatment and a final screening of the bleached pulp.

[2568]. 33.32.1 : 12.26–8 (43.1–5). MALCOLM, A. M. **Pulping of Beechwood with nitric acid at Wolfen near Leipzig.** *Final Rep. Brit. Intell. Obj. Sub-comm.* No. 58, Item No. 22 [n.d.]. pp. 13 + fig. P.R.

An account is given of the process and plant used for making pulp from Beech wood with nitric acid. The wood was cooked with nitric acid, neutralized and cooked in the digester with soda lye, removed from the digester, chlorinated, refined with strong soda lye and bleached.

[2569]. 33.32.1 : 12.26–8. MCGOVERN, J. N. **Use of bleached Aspen semichemical pulp in groundwood book paper.** *Paper Tr. J.* 123 (20), 1946 (47–52). P.R.

The use of bleached Aspen semichemical pulp to replace softwood sulphite pulp in a groundwood book paper for coating was investigated at the Forest Products Laboratory, Madison, in experiments with test sheets, experimental paper machine runs, and mill-scale trials. The bleached semichemical pulp was made from neutral sulphite semichemical pulp by a chlorination-hypochlorite bleaching process. The bleached pulp yield was nearly 58 per cent. of the wood, the brightness value was about 74 and the beater-test strength characteristics equalled or exceeded those of a commercial bleached softwood sulphite pulp with the exception of a somewhat low tearing strength.

The physical properties of the pulp system, consisting of Aspen groundwood and bleached Aspen semichemical pulps, were obtained in test-sheet experiments. The effect on this system of the addition of bleached softwood sulphite, bleached Aspen sulphate, or bleached Aspen sulphite pulps was also determined.

In the papermaking trials on the Laboratory's experimental machine, a small increase in

tearing strength was noted when, in an original Aspen furnish of 45 per cent. bleached semichemical and 55 per cent. groundwood pulp, the proportion of semichemical pulp was reduced successively by the addition of 10, 20 and 25 per cent. of bleached softwood sulphite pulp. The substitution of 10 and 20 per cent. of bleached Aspen sulphite or bleached Aspen sulphate pulps had little effect on paper strength.

In the mill papermaking trials, the regular mill furnish of 47 per cent. of a mixture of bleached and unbleached softwood sulphite pulp and 53 per cent. Aspen groundwood pulp was changed to one consisting of 35 per cent. bleached Aspen semichemical, 15 per cent. bleached softwood sulphite and 50 per cent. Aspen groundwood pulp. This high Aspen content furnish was run with slight difficulty in a short papermaking trial, the paper was machine-coated and supercalendered without trouble, and the finished paper was successfully printed and used in an issue of a popular magazine. An all-Aspen furnish of 50 per cent. bleached semichemical and 50 per cent. groundwood pulp was run with considerable difficulty, although the coated paper obtained approached standard paper in strength properties and printing quality. The pulps of high Aspen content tended to be slow and sticky and to have low wet-web strength. *Author's summary.*

[2570]. 33.32.1 : 12.26–8. KINGSBURY, R. M., SIMMONDS, F. A., MILLS, R. T., and FENNELL, F. L. **Bleaching Aspen neutral sulphite semichemical pulp with sodium peroxide.** *Paper Tr. J.* 123 (11), 1946 (50–4). P.R.

An Aspen neutral sulphite semichemical pulp of 72 per cent. yield, with an unbleached brightness of 57 and containing 11 per cent. of lignin, was bleached by means of a one-stage sodium-peroxide process to a maximum brightness of 74. The effects of variations in the amount of sodium peroxide used and in the initial alkalinity of the bleaching solution were studied, and some data were obtained on the effect of variations in temperature and consistency.

With sodium peroxide at 52° C. and 12 per cent. consistency, it was found that, by using 6 per cent. sodium silicate and not more than 0·1 per cent. magnesium sulphate, and by adjusting the pH to 5 with sulphurous acid at the end of the bleach, brightness values of 70·5, 72·5, and 74 were attained with 2, 3 and 4 per cent. respectively of the peroxide. Reaction time ranged from 5 to 7 hours. Shrinkage did not exceed 3·5 per cent. There was a small but definite increase in pulp strength. *From authors' summary.*

[2571]. 33.32.1 : 31.3. GIERTZ, H. W. Om massans eftergulning. **[On the after-yellowing of pulp.]** *Medd. Svenska TräforsknInst. (Träk. och Papperstek.)* No. 6, 1945. pp. 7. [Sw.g.e.] *Repr.* from *Svensk PappTidn.* 48, 1945 (317–23). P.R.

The discoloration of a bleached pulp cannot be traced to lignin decomposition products and only to a small extent to resins: the main cause lies in decomposition products formed by carbohydrates during bleaching. Bleaching should therefore occur under as mild conditions as possible, for which purpose chlorine dioxide is suitable and yields no products that would cause yellowing. Some of the wood polyoses of hemicellulose cause pronounced yellowing; these are present in strong sulphite pulp, but are rare in very soft sulphite pulps that have been treated fairly energetically with alkali between bleaching stages. Sulphate pulps do not contain such polyoses. Degradation products formed during bleaching may be partially dissolved by alkali. Acidification of pulp after bleaching will increase the yellowing. *From author's summary.*

[2572]. 33.32.1 : 31.1. MONTIGNY, R. DE, and ZBOROWSKI, P. **The rapid measurement of an index of fiber length. Part I. Description of the test method.** *Paper Tr. J.* 123 (19), 1946 (42–8). P.R.

A pulp testing method is described whereby a dilute aqueous suspension of fibres is made to flow past a set of fixed vertical blades under standardized conditions. The fibres caught by the blades are collected and weighed. This weight provides an index of fibre length. The apparatus and experimental techniques are described in detail and the factors which affect the results obtained are examined. The method is sufficiently simple, rapid and precise for routine work.

A theoretical analysis of the mechanism of the method is presented, as well as data supporting the conclusion that the index is a function of the average by weight of the square root of

the fibre length. These data also show that the index is very sensitive to changes in fibre length but indicates that the relation between the index and the fibre length, as calculated from Johnston Classifier data, is different for different types of pulps. *Authors' summary.*

[2573]. 33.32.1 : 31.1. MONTIGNY, R. DE, and ZBOROWSKI, P. **The rapid measurement of an index of fiber length. Part II. Some relationships of the index to pulp properties and indications of its use for stock preparation control.** *Paper Tr. J.* 123 (22), 1946 (29–34). P.R.

A single bleached sulphate pulp has been extensively studied and empirical relationships derived which show that, for a given pulp, bulk and tearing strength are simple straight-line functions of fibre length index independent of slowness, but that bursting and tensile strengths are more complex properties involving both fibre length and slowness as measured by the Schopper-Riegler instrument. Exploratory work shows that these relationships are different for different types of pulp and that some may vary from pulp to pulp of the same type.

Preliminary work with the fibre length index in mill practice confirms the laboratory findings of such relationships for a constant furnish and a first trial of dual control of both slowness and fibre length index gave definite reduction in the variations of paper quality. *Authors' summary.*

[2574]. 33.32.1 : 31.3. **Cellulose in pulp: revision of TAPPI official standard T201m–45.** *Paper Tr. J.* 123 (25), 1946 (33–4). P.R.

The apparatus and procedure for isolating total cellulose in pulp by a process of chlorination are described in detail.

33.32.3. *Wallboards, Fibreboards, etc.*

[2575]. 33.32.3. PECORARI, A. Panneaux en fibre de bois et l'utilisation des bois feuillus. **[Fibreboard and the utilization of hardwoods.]** *Rev. int. Bois* 31 (112), 1946 (156–62, 167). [F.]

A general review of the subject with a detailed comparison of the Defibrator, Fibroplast and Masonite processes. It is concluded that the Masonite process is undoubtedly the most economical and highest yielding process, that the finished product is of very high quality and, in some respects, superior to the product of other processes.

[2576]. 33.32.3 : 33.1 : 34.6. DREYFUS, H., WALKER, W., and ROONEY, J. H. (to British Celanese Ltd.) **Constructional material from wood flour and cellulose esters.** *U.S. Patent* No. 2,400,078, May 14th, 1946. Chem. Abstr. 40, 1946 (5542–3). P.R.

A moulded board is prepared from wood flour or sawdust and a plasticized, water-insoluble cellulose ester or ether. A solution of cellulose acetate 10, triacetin 10, acetone 25, EtOH 10, and C_6H_6 15 is mixed with 2–5 times its weight of sawdust; the mixture is dried and then moulded into boards under heat and pressure. The product is useful as a building material.

[2577]. 33.32.3 : 33.36.2. MCNAUGHTON, G. C., and KLEECK, A. VAN. **Fire resistance tests of a commercial blanket insulation.** *Rep. U.S. For. Prod. Lab., Madison* No. R1488, 1945. pp. 4 + tbls. + figs. P.R.

Several types of wall panel, insulated with a commercial type of wood fibre blanket, were subjected to fire tests. Panels faced with plaster or gypsum board, where the fire resistance was more than 40 minutes, showed no appreciable increase or decrease in fire resistance with such insulation. Plywood-faced panels, where the normal resistance of the uninsulated test specimens was 21 minutes or less, showed a consistently improved fire resistance with the wood fibre blanket insulation.

33.32.4. *Plastics*

[2578]. 33.32.4 : 34.6 : 33.3. HARVEY, M. T. (to Harvey Research Corp.). **Modified lignin resins.** *U.S. Patent* No. 2,404,480, July 30th, 1946. Chem. Abstr. 40, 1946 (6294). P.R.

Thermosetting fusible resins (I) of good flow characteristics are obtained by heating lignin (II) or a cellulose-bearing vegetable matter containing (II) with heat-reactive resins made from CH_2O and furfuryl alcohol (III) or polymerized acid condensation products of (III). (I) is H_2O- and alkali-resistant, can be moulded at lower temperatures than (II) alone, will not distort or crack when removed hot from the

mould, cures if heated 1–5 minutes at 300–380° F., and is used as a coating material and, with the proper fillers, for brake linings.

33.33. Manufacture of Textiles from Wood

[2579]. 33.33 : 12.26–8. TASKER, C. W., and LIBBY, C. E. **The manufacture of viscose from Sugar Maple, *Acer saccharum*, Marshall.** *Paper Tr. J.* 123 (23), 1946 (139–48). P.R.

In an attempt to prepare viscose-grade pulp from Sugar Maple by the sulphate process, pulps were produced with relative ease, but they were universally high in pentosan content, which ranged from 17 to 18 per cent. This pentosan content could not be reduced by varying the cooking time from 2 to 5·5 hours, nor by varying the cooking temperature employed from 165 to 175° C., all other cooking conditions being constant. It was materially reduced by an acid-hydrolysis/alkaline-extraction refining process. The best refined pulps had a pentosan content of 3 to 6 per cent. In the acid hydrolysis stage of this process the temperature was the most important variable; the amount of acid used and the length of hydrolysis treatment followed in order. The optimum acid treatment conditions were temperature 90° C., 20 per cent. hydrochloric acid based on pulp weight, 2 hours reaction time, and 5 per cent. pulp consistency. In the alkaline extraction stage of the process the quantity of chemical employed was the most important variable. The optimum alkali extraction conditions were found to be 100 per cent. sodium hydroxide based on the pulp weight, 2 hours reaction time at a temperature of 0° C., and a pulp consistency of 10 per cent.

The refined pulp made by this investigation, after a single-stage hypochlorite bleach, gave a product which compared favourably with commercial softwood and hardwood sulphite pulps generally used by the viscose industry. *Authors' summary.*

33.34. Dyeing and Bleaching of Wood

[2580]. 33.34 : 33.31. VALASHEK, E. R. **Colouring wood.** *U.S.S.R. Patent* No. 64,593, Apr. 30th, 1945. Chem. Abstr. 40, 1946 (5543–4). P.R.

Wood is heated to 50–60° and is coated with a cold solution containing *p*-aminophenol sulphate, $CuSO_4$, and permanganate. The wood is then coated with the same solution warm. While still wet, the wood is treated with NH_3 and then dried at 60–75°. Finally, the wood is polished or otherwise treated.

[2581]. 33.34 : 33.31. SIMARD, J. M. **Fixation of ammonia in wood.** *Ann. Ass. franç. canad. Advanc. Sci.* No. 7, 1941 (82). Chem. Abstr. 40, 1946 (1299). P.R.

During coloration of Cherry wood with ammonia solution or gas, the N taken up by the wood (2·96 per cent.) was distributed as follows: absorbed by the pores and easily removed, 1·71 per cent.; N of constitution, 0·16 per cent.; N. in ammoniated tannin, 0·02 per cent.; N in ammoniated lignin, 1·02 per cent.; and N not identified 0·05 per cent. The lignin fraction of the wood, therefore, seems to combine with ammonia to give the brownish complex, without affecting its mechanical or keeping qualitities but giving it the appearance of old Oak.

33.36. Preservation of Wood. Seasoning and Drying

[2582]. 33.36. **Paint and wood work together.** *Timber of Canada* 7 (2), 1946 (54, 57, 59).

The paint-holding capacity of a board depends primarily upon the amount and distribution of summer wood, which is less retentive of paint than the spring wood. In a test conducted by the U.S. Forest Products Laboratory, the Cedars (*Juniperus* spp.) and Cypress held paint best, and Northern White Pine [*Pinus strobus*], Western White Pine [*P. monticola*] and Sugar Pine [*P. lambertiana*] almost as well. Serious flaking of the coatings from the summer wood occurred sooner in Southern Yellow Pine [? *P. echinata*], Douglas Fir and Western Larch [*Larix occidentalis*] than in the other species tested. Western Yellow Pine [*P. ponderosa*], White Fir [*Abies* sp.], the Hemlocks and the Spruces came midway between the other two groups. The wood of many species varies greatly in density and texture, and therefore in painting characteristics. Thus, light, narrow-ringed boards of Douglas Fir hold paint about as well as wide-ringed boards of Cypress, and light, narrow-ringed boards of Western Yellow Pine behave like White Pine.

Knots and pitch give trouble in painting, particularly in White and Yellow Pines. Edge-grained boards hold paint far better than flat-grained boards, and among flat-grained boards, those surfaces on the bark side are more satisfactory to paint than those on the pith side. Notes are given on the methods of applying paint and the common types of exterior paint failure.

33.36.1. *Preservation against Attack by Plants and Animals*

See also *For. Abstr.* 8 (No. 2448).

[2583]. 33.36.1. ANGELL, H. W. **Getting the most from treated lumber: a discussion in brief of the characteristics of pressure-treated wood affecting user-satisfaction.** *Sth. Lumberm.* 173 (2177), 1946 (250–2, 254).

Discusses the appearance, weight, strength, paintability, gluability, inflammability, electrical resistance, corrosiveness and hygroscopicity of pressure-treated wood.

[2584]. 33.36.1. TAMBLYN, N. **Experimental treatment of timber with preservatives at high pressures.** *For. Prod. News Lett. C.S.I.R. Aust.* No. 147, 1946 (3).

Thirty-one different Eucalypt species and sixteen non-Eucalypt timbers were tested with zinc chloride and creosote oil using pressures of 200 and 1,000 lb./sq. in. Treating temperature was raised to 150° F. without causing collapse except in low-density softwood timbers. In many cases absorption was doubled or trebled at the higher pressure, and 16 of the 31 species absorbed more than 5 lb. of creosote oil per cu. ft. Absorption of water-soluble preservative was in all cases much greater than for creosote oil, several species absorbing 20–30 lb. of solution per cu. ft. Non-Eucalypt timber behaved very similarly, Douglas Fir absorbing 3·3 lb. creosote at 200 lb. pressure, compared with 10·8 lb. at 1,000 lb. pressure. No conclusions have yet been reached as to the commercial practicability of such high pressure treatment.

[2585]. 33.36.1 : 07.7. BOLIDENS GRUVAKTIEBOLAG. **Process and device for full-cell impregnation of timber and similar material.** *Brit. Patent* No. 578,308, 1946. pp. 3 + fig. P.R.

[2586]. 33.36.1 : 31.43 : 13.2 (68.9) : 01.7. DUFF, C. E. **The common timber borer of Northern Rhodesia.** *J. S. Afr. For. Ass.* No. 14, 1946 (37–45). [Forest Department, Ndola, Northern Rhodesia.]

This paper is a summary of 2 years' observations upon a common powder-post borer of native timbers in the Copperbelt (?*Xylion adustus*). The first part gives a short description of the insect itself, its life history, mode of attack and natural enemies. The second part describes experiments with preservative dips. The method which was used in these experiments to express the results seems a convenient one in small biological field tests of this kind.

[2587]. 33.36.1 : 31.43 : 13.2 (943). YOUNG, W. **Immunising timber against *Lyctus* attack.** *Aust. Timb. J.* 12 (8), 1946 (437, 475–6).

Treatment with boric acid in order to immunize timber against *Lyctus* attack is now being used commercially in Queensland. The more difficult timbers, such as Brown Tulip Oak (*Tarrietia argyrodendron*) are treated by the 'hot and cooling' method; the more easily penetrable timbers, such as *Alstonia scholaris*, are treated by plain cold or hot soaking. The vats are constructed with concrete walls and floor, with a bulkhead door of wood on a steel frame. The interior of the vat is lined with copper. Details are given of the process being used for 1-in. Brown Tulip Oak.

[2588]. 33.36.1 : 31.43 : 13.2 (81). ALMEIDA, D. G. DE. Combate ao cupim. **[Termite control.]** *Rev. flor., Rio de J.* 4 (2), 1945 (24–42). [Port.]

An account of tests with Permatol (pentachlorophenol) against termites in Brazil in 1939–42. Many particularly susceptible species, such as *Cariniana excelsa*, *Schizolobium excelsum*, *Mimosa bracaatinga*, *Araucaria angustifolia*, and *Eucalyptus longifolia*, can be made resistant to termite attack by dipping. The article is profusely illustrated with photographs of treated and untreated wood samples.

[2589]. 33.36.1 : 33.31. ALLIOT, H. L'emploi du pentachlorophénol et du pentachlorophénate de soude dans la protection du bois. **[The use of pentachlorophenol and sodium pentachlorophenate in wood preservation.]** *Rev. Bois Appl.* 1 (4), 1946 (21–4). [F.] P.R.

A summary is given of the properties of pentachlorophenol as a wood preservative. Some experiments were made in France with sodium pentachlorophenate, which was found suitable as a preservative where only a shallow penetration is required, and where the wood is not exposed to damp.

[2590]. 33.36.1 : 33.31 : 33.6. SCHEFFER, T. C. **Chemical dipping treatments for controlling molding and staining of wood boxes and crates.** *For. Pathol. spec. Release U.S. Dep. Agric.* No. 28, 1946. pp. 11 + tbls. + figs. P.R.

Surface applications of 109 solutions of single and mixed chemicals were tested for mould and blue-stain control on panels of Pine and Sweetgum sapwood held in damp storage for 2 months at a temperature of 80 to 85° F. The chemicals were applied in water and in organic solvents, chiefly solvent naphtha.

Leaching of the treated wood for 4 hours in quiet tap water did not appreciably lessen the amount of fungus control obtained. Of the tested aqueous treatments, only those containing sodium pentachlorophenate were effective enough and adequate in other respects for general use against moulding and staining of wood containers subjected to damp conditions. The most promising of these were:—Sodium pentachlorophenate, 5 per cent.; sodium pentachlorophenate + borax, 2 + 2 per cent.; sodium pentachlorophenate + borax + phenyl mercuric oleate (in emulsion), 1 + 1·5 + 0·1 per cent.; sodium pentachlorophenate + borax + ethyl mercuric phosphate, 1 + 1·5 + 0·032 per cent., and possibly sodium pentachlorophenate + ethyl mercuric phosphate, 2 + 0·032 per cent. The mixtures would be less liable to cause dermatitis than the 5-per-cent. sodium pentachlorophenate and would cost considerably less.

Nearly as effective were:—Sodium pentachlorophenate + borax, 1·5 + 1·5 per cent.; sodium pentachlorophenate + borax + ethyl mercuric phosphate, 1·5 + 1·5 + 0·008 and 1 + 1·5 + 0·016 per cent., and possibly (alkyl quaternary) ammonium pentachlorophenate 0·8 per cent.

Some which were less effective but which might give reasonably good fungus control under drier conditions were:—sodium pentachlorophenate, 2 per cent., and sodium pentachlorophenate + borax, 1 + 1·5 per cent.

The outstanding chemicals applied in organic solvents were:—pentachlorophenol, 5 per cent. and 8-hydroxyquinoline, 2 per cent.

Less effective but providing a substantial degree of mould and stain control were:—pentachlorophenol, 2 per cent.; copper naphthenate, 2 per cent. Cu; zinc naphthenate, 2 per cent. Zn, and iron naphthenate, 2 per cent. Fe. *From author's summary.*

[2591]. 33.36.1 : 33.31. RICHARDSON, N. A. **Wood preservatives.** *Rec. For. Prod. Res., Lond.* No. 17 (revised), 1946. pp. 10. P.R.

A summary of the properties of the main types of wood preservative. Their suitability for different kinds of timber work, and methods of applying them are also discussed.

[2592]. 33.36.1 : 33.31 : 31.42.11. EDÉN, J., and RENNERFELT, E. Undersökningar enligt klotsmetoden av några träimpregneringsmedel. [**Tests of some wood preservatives by the wood-block method.**] *Medd. Skogsforskn-Inst.* [*SkogsförsöksAnst.*], *Stockh.* 35 (10), 1947. pp. 36. [Sw.sw.g.e.]

Comparative tests were made on Basilit UA, Boliden salt, 'Boliden fluorine salt' (prepared for experimental purposes)—all used at ½- and 1¼-normal as well as at normal rates, and creosote oil at 75 and 150 kg. per cu.m. sapwood. A series of treated blocks were leached for 1 month in running water, and some of the creosoted blocks were subjected to a vacuum, before testing, which involved 4 months' exposure to the fungi:—*Coniophora cerebella*, *Lenzites sepiaria*, *Lentinus squamosus*, *Polyporus vaporarius*, *Trametes serialis* and *T. trabea* (all Swedish cultures, but German cultures of *L. squamosus* and *P. vaporarius* were also used). Salt-impregnated, unleached blocks, and creosoted blocks irrespective of other treatment, showed no attack. Serious attack (12–22 per cent. loss by weight) occurred only in blocks treated with Basilit UA at ½-normal rate, leached and exposed to decay by *C. cerebella*. Some of the other fungi were also able to attack blocks so treated. The German strain of *L. squamosus* attacked leached blocks initially treated with Basilit UA at normal and even at 1¼-normal rates.

Leached blocks treated with either of the Boliden salts at half the normal rate showed slight damage after exposure to the German

strain of *P. vaporarius*. The normal rate gave satisfactory protection throughout.

A few individual salt-treated and leached blocks lost more than 5 per cent. by weight and a rather larger number showed slight attacks causing a lower weight loss. Most, however, showed no visible damage in spite of slight weight losses. A special test with sound blocks indicated that unimpregnated blocks lost some weight in leaching, while impregnated blocks sometimes lost and sometimes gained a little. The small weight losses recorded for almost all impregnated blocks are probably due in most cases to small unavoidable losses and errors in procedure.

The fungus attacking the greatest number of blocks was the German *L. squamosus*, followed by the German *P. vaporarius*.

[2593]. 33.36.1 : 33.31 : 33.36.2. PAVLOVICH, A. G. **Preservation and fireproofing of wood.** *U.S.S.R. Patent* No. 65,106, Aug. 31st, 1945. Chem. Abstr. 40, 1946 (7506). P.R.

Wood is impregnated with the acid solution obtained in decomposing natural borates in the preparation of borax and boric acid.

[2594]. 33.36.1 : 33.5 : 31.42.1 : 31.43 (94). LUDBROOK, A. J. **Preservation of sleepers and poles, and other notes about counters to termites, insects and fungi.** *Aust. Timb. J.* 12 (9), 1946 (504, 511–3).

A summary account by the Division of Forest Products of the C.S.I.R. of the position in Australia with regard to termite, *Lyctus*, *Anobium*, and fungus attack on wood and the methods of preservation at present in use.

[2595]. 33.36.1 : 33.52 (73). **Report of committee 17—wood preservation.** *Bull. Amer. Rly. Engng. Ass.* No. 451, 1945 (479–88). L.S.

Service records of Tamarack and Hemlock test tracks on the Northern Pacific Railway and of sleepers of various species on test tracks of the Chicago, Milwaukee, St. Paul and Pacific Railway up to the end of 1944 are given. A brief specification for a creosote-petroleum mixture is included.

[2596]. 33.36.1 : 33.53 : 07.7. **Technical bulletin on process and equipment for treatment of poles by hot-cold full length open tank method using Santophen 20.** *Tech. Bull. Monsanto* No. 0–35, 1946. pp. 29 + figs. Monsanto Chemicals Ltd., St. Louis 4, Missouri, U.S.A. M.C.

The bulletin gives a general description of the process of treating wood poles with Santophen 20 by the hot-cold full-length open-tank, non-pressure method, with the results of an engineering study, i.e. description of equipment, cost estimates, a process flow sheet, plans of a typical plant, etc. The object of the study is to supply basic information needed for the design of treating plants using this method.

[2597]. 33.36.1 : 33.53 : 12.25. MACLEAN, J. D. **The preservative treatment of various species proposed for poles and crossarms.** *Rep. U.S. For. Prod. Lab., Madison* No. R1628, 1946. pp. 11. P.R.

The 'American War Standards Specifications and Dimensions for Wood Poles' [see *For. Abstr.* 8 (No. 1999)] includes as substitute woods miscellaneous conifers which need preservative treatment, and were not previously recognized as standard pole woods. Types of preservative treatment needed for poles and cross-arms made from these species are discussed and described.

[2598]. 33.36.1 : 33.54 (74.6). **Creosoted Pine guard rail posts in Connecticut.** *Wood Pres. News* 24 (9), 1946 (85–6, 9). P.R.

A table gives the service records since 1934 of some 7,000 posts installed in the state of Connecticut, with comparison of the service life of untreated posts, those given brush or open-tank treatment, and those pressure-creosoted.

[2599]. 33.36.1 : 33.54 (75.6). SMITH, W. R., and HERTZLER, R. A. **The preservative treatment of fence posts.** *Resour.-Ind. Ser. N.C. Dep. Conserv.* No. 1, 1946. pp. v + 18. P.R.

Technical and economic information on the preservative treatment of fence posts, intended for the use of people who plan to set up a small plant.

[2600]. 33.36.1 : 33.54 : 33.4 : 33.8. BRYAN, J. **The preservation of agricultural timber.** *Agriculture* (*J. Minist. Agric., Lond.*) 53 (10), 1947 (462–6). [Forest Products Research Laboratory, Department of Scientific and Industrial Research.] O.R.E.

Deals briefly and from a practical viewpoint with causes of decay, the main types of preservative, and methods of applying wood preservatives (surface treatments and impregnation) with special reference to the purpose for which the wood is intended (fence posts and stakes; sheds and wooden buildings; machinery and tools).

33.36.2. *Fireproofing*

See *For. Abstr.* 8 (No. 2593).

33.36.3. *Seasoning. Drying*

See also *For. Abstr.* 8 (No. 2638).

[2601]. 33.36.3. BATESON, R. G. **Timber drying and the behaviour of seasoned timber in use.** Crosby Lockwood & Son Ltd., 20 Tudor Street, London, E.C.4. 2nd ed., 1946. pp. x + 129 + plates. Price 10s. 6d. net.

A new edition of a book first published in 1938. Particular attention is given to the problems of the small undertaking and to the difficulties of kiln drying from the green condition.

[2602]. 33.36.3 : 07.7. TWYBLE, J. A. **Drying of timber.** *Brit. Patent* No. 578,379, Nov. 26th, 1943. *Brit. Abstr.* BI, 1946 (335). P.R.

Timber is rapidly dried by heating in a kiln having a hot floor surface, e.g. of refractory or metal plate, on which H_2O containing $Ca(OH)_2$ 28 and/or Na HCO_3 14 lb. per gallon is projected so as to subject the timber to an atmosphere of steam for about 8 hours and then to the flow of drying air from a blower for about 40 hours. The pores of the wood are opened by the heat and filled by the $NaHCO_3$. It is claimed that Beech timber may thus be dried from a 45-per-cent. H_2O content to 12–15 per cent. H_2O content in about 48 hours without affecting its quality.

[2603]. 33.36.3 : 07.7. WILLIAMS, C. J. **Better seasoning of lumber and veneer—reducing handling and drying costs.** *Sth. Lumberm.* 173 (2177), 1946 (298, 300, 302, 304).

A brief account of some recently developed mechanical devices, such as automatic stackers, time switches, humidity and pressure controllers, which have been introduced into seasoning kilns.

[2604]. 33.36.3 : 12.26–8. ANDERSON, E. A. **Kiln drying hardwoods green from the saw.** *Sth. Lumberm.* 173 (2174), 1946 (44).

The Forest Utilization service of the Southern Forest Experiment Station carried out a comprehensive study of chemical seasoning of southern hardwoods sawn green. The data are still being analysed, but it is already apparent, incidentally, that much of the degrade of kiln-dried wood is due to defective kilns and unskilled operators.

[2605]. 33.36.3 : 12.26–8. TORGESON, O. W. **Accelerated type of kiln-drying schedule for one- and two-inch Black Gum.** *Sth. Lumberm.* 173 (2177), 1946 (206–8).

Schedules are given, based on the results of tests at the Madison Forest Products Research Laboratory, for the kiln-drying of wood of *Nyssa sylvatica*. Recent experience has shown that drying time may safely be reduced through the use of lower intermediate relative humidities, and higher initial temperatures.

[2606]. 33.36.3 : 33.53 : 07.7. BURPEE, C. M. **New process seasons ties overnight.** *Timber of Canada* 7 (2; 3), 1946 (65–8, 79; 61–4, 70). Also in *Rly. Age* 120 (10; 11), 1946 (494–7; 538–41).

An account of the Taylor-Colquitt vapour drying process. [Cf. *For. Abstr.* 8 (p. 189).]

[2607]. 33.36.3 : 33.31. KVALNES, H. I. (to E. I. du Pont de Nemours & Co.). **Treatment of wood.** *U.S. Patent* No. 2,402,331, June 18th, 1946. Chem. Abstr. 40, 1946 (7556). P.R.

Checking and cracking of wood during drying are prevented by the application to green woods (as Fir, Hickory or Oak) of a water-resistant aqueous, dispersed resinous film particularly effective in sealing board ends to promote even drying. To form this economical, non-dripping dispersion, an emulsion of butyl methacrylate monomer 5–50, benzoyl peroxide 1, castor oil 3–7, lauryl sodium sulphate 0·5–5, and water 47–80 parts, is polymerized, and mixed with paraffin 2–45, and partly hydrolysed polyvinyl acetate 47·5–80 parts. Thirteen formulas are given.

33.37. Distillation. Manufacture of Tar

]2608]. 33.37. BERGSTRÖM, H. O. V., CEDERQUIST, K. N., and TROBECK, K. G. **Liquid products from wood and other vegetable material.** *Swed. Patent* No. 105,339, Sept. 1st, 1942. Chem. Abstr. 40, 1946 (7627). P.R.

Wood and similar vegetable material, prior to dry distillation, is treated with one or more water-soluble bases with or without the addition of other inorganic material such as metal sulphides or salts. The mixture is heated slowly to the distillation temperature so that thorough impregnation of the wood or the like takes place before distillation proper. The base may be applied as an aqueous solution or may be mixed dry, if desired, followed by steaming In an example, sawdust impregnated with NaOH, H_2O, and $Ca(OH)_2$ and heated slowly to 500° yields 16 per cent. of water-soluble alcohols and ketones, 11 per cent. of oils and 3·2 per cent. of gas (mainly H).

[2609]. 33.37 : 12.26–8 : 34.6 : 33.1. CHURCHOUSE, A. **Wood distillation in Britain.** *Timber News* 54 (2089), 1946 (414–5, 417). P.R.

Yields of chemical products from the distillation of some American and English hardwoods are given, and the possibility of using sawdust and other types of wood waste for distillation is discussed.

[2610]. 33.37 : 33.38.1 : 12.25 : 12.26–8. DUUREN, A. J. VAN. Een eenvoudig toestel voor houtverkoling en de bepaling van de destillatieproducten. **[A simple apparatus for the carbonization of wood and the determination of the products of distillation.]** *Chem. Weekbl.* 42 (3/4), 1946 (19–20). [Du.] [Laboratorium van de Afd. Handelsmuseum van het Indisch Instituut, Amsterdam.] I.C.I.

Description, with scale diagram, of simple apparatus, designed to fit into a Heraeus-Hanau electric furnace, for reproducible determinations of the distillation products of woods. Standard procedures are suggested for distillation and for the determination of tar, acetic acid and methanol. Test results from two trial runs each of heartwood and sapwood of *Pinus merkusii* and of Walaba (*Eperua* spp.) are included as examples.

33.38. Charcoal Manufacture. Use of Wood and Charcoal in Producer-gas Generators

See also *For. Abstr.* 8 (No. 2685).

[2611]. 33.38 (66). AUBRÉVILLE, A. Contribution à l'étude des charbons de bois de l'Afrique Occidentale française. **[Contribution to the study of charcoals from French West Africa.]** Comité national des Bois coloniaux, 16 Rue de la Paix, Paris 2e, 1941 pp. 35. [F.] *Extr.* from *Act. C.R. Ass. Colon.-Sci.* 177/185, 1940.

Report on experiments made by the Government of French West Africa in 1938–39. The results are presented in a series of tables. Among the commoner species which were found to make good charcoal were *Acacia nilotica, A. raddiana, A. senegal, Balanites aegyptiaca, Zizyphus jujuba, Dichrostachys glomerata, Combretum micranthum* and *C. glutinosum.*

[2612]. 33.38.1 (92 : 88) : 33.37. SPOON, W. Houtverkoling in overzeesch Nederland voor metallurgische doeleinden. **[Charcoal manufacture in Dutch overseas territories for metallurgical purposes.]** *Nederl. Boschb.-Tijdschr.* 18 (12), 1946 (273–80); 19 (1), 1947 (17–26). [Du.e.]

A review. Both in the Dutch East Indies and Surinam the natives manufacture charcoal extensively for domestic use, but by rather primitive methods. Charcoal for metallurgical use must be of first quality and can be produced only in kilns or retorts. The extra cost involved would have to be met from sales of by-products, which would be tar and methyl alcohol, as the yield of acetic acid from most of the species examined would be too low to warrant recovery. Experiments on the production of high-grade charcoal, with recovery of by-products, are summarized and a brief account is given of an Aminoff kiln installation on Banka Island, which produced charcoal for tin smelting, methyl alcohol and tar, from local woods. Results of distillation trials and charcoal analyses of material from Surinam and the Dutch East Indies are tabulated.

[2613]. 33.38.1 : 33.52 : 07.7. GUILLAUME, P. Carbonisation des vieux bois d'essences dures créosotés. **[Carbonization of old,**

creosoted, hardwood timbers.] *Rev. int. Bois* 13 (113), 1946 (173–9). [F.]

An account of the S.N.C.F. kilns for manufacturing fuel charcoal from old creosoted railway sleepers by the Guillaume process. [Cf. *For. Abstr.* 8 (No. 1274).]

33.39. Manufacture of Sugar, Oils, Alcohol, and Miscellaneous Chemical Products from Wood

See also *For. Abstr.* 8 (No. 2552).

[2614]. 33.39. HUDSON, M. S. **Hydrolysis of wood.** *Canad. Patent* No. 435,896, July 23rd, 1946. Chem. Abstr. 40, 1946 (6815). P.R.

Comminuted wood is hydrolysed by steam in the presence of an acid catalyst, e.g. HCl or H_2SO_4; during the hydrolysis the condensate from the steam and the hydrolysis products soluble therein are separated from the wood, and hydrolysis products are continuously recovered; the wood residue is washed with water and then extracted with an organic vapour.

[2615]. 33.39 (43.1–5). SAEMAN, J. F. LOCKE, E. G., and DICKERMAN, G. K. **The production of wood sugar in Germany and its conversion to yeast and alcohol.** *Paper Tr. J.* 123 (12), 1946 (38–46). P.R.

Processes used in Germany for producing wood sugar, yeast and alcohol are described, with particular reference to the Waldhof method of yeast production. [Cf. *For. Abstr.* 8 (Nos. 522–3).]

[2616]. 33.39 (43.1–5) LOCKE, E. G., SAEMAN, J. F., and DICKERMAN, G. K. **The production of wood sugar in Germany and its conversion to yeast and alcohol.** *FIAT Final Rep. Brit. Intell. Obj. Sub-comm.* No. 499, 1945. pp. 117. P.R.

Cf. preceding abstract.

[2617]. 33.39 (43.1–5) : 31.3 : 33.32.1. SAEMAN, J. F., LOCKE, E. G., and DICKERMAN, G. K. **Wood and cellulose research in Germany.** *FIAT Final Rep. Brit. Intell. Obj. Sub-comm.* No. 450, 1945. pp. 18 + v + v + xii + vi.

Some of the leading German wood and cellulose research workers in Western Germany were interviewed.

An unpublished thesis by a student of Staudinger was obtained on the different behaviour of various celluloses towards xanthation.

It was learnt from Dr. Scholler that important advances had been made in the fermentation of wood sugars to alcohol and to yeast. The methods needed for both of these processes are continuous and faster than any comparable operations in the United States. Still bottoms have been converted to fodder yeast on a commercial scale in at least one German and two Swiss plants. [Cf. *For. Abstr.* 8 (Nos. 523, 1279.]

Details were obtained from the Friedrich Bergius Research Laboratory of an interesting process for the continuous concentrated acid hydrolysis of wood. This has gone through only the first stages of development in the laboratory, but it gives some promise of overcoming serious disadvantages in the present Bergius process. [See *For. Abstr.* 8 (Nos. 522, 1282).]

Appendices give lists of references to recent publications of Staudinger, Freudenberg and Jayme. *From authors' summary.*

[2618]. 33.39 (73). HALL, J. A. **The wood-sugar industry and its relation to management.** *J. For.* 44 (11), 1946 (866–70). [Pacific Northwest Forest and Range Exp. Sta., Portland, Ore.]

An account of the planning and forecast of the production of the new wood-alcohol plant at Springfield, Ore. [Cf. *For. Abstr.* 8 (No. 525).]

[2619]. 33.39 : 12.25 : 34.6. ANDERSON, A. B. **Chemistry of Western Pines: effect of solvents on extractives from Ponderosa Pine.** *Industr. Engng. Chem.* (*Industr. Ed.*) 38 (7), 1946 (759–61). [Western Pine Association Research Laboratory, Portland 2, Ore.] P.R.

This preliminary investigation indicated that solvents may vary materially in their ability to remove extractives from Ponderosa Pine sawdust. The order of extractive action of the solvents investigated thus far is: (1) ethanol-benzene, (2) ethanol, (3) methanol, (4) acetone, (5) ethylene dichloride, (6) benzene, (7) ethyl ether, and (8) petroleum ether. The last and least efficient solvent was approximately 75 per cent. as effective as ethanol-benzene. Ethyl ether and the low-boiling petroleum ether are

laboratory solvents and not generally applicable to commercial extraction processes; of the remaining commercially feasible solvents, the water-miscible type appears to be most effective for removal of extractives.

The solvents exhibited varying selective extraction action for the various extraneous components in the wood. Thus, the mixed solvent ethanol-benzene was the most effective for removing the water- and ether-insoluble fraction. The water-soluble component was most efficiently removed from methanol. Ethanol-benzene and ethylene dichloride were about equal in their ability to remove resin acids; acetone was most efficient in extracting free fatty acids. The amounts of volatile removed by the various solvents, in the main, were comparable. Benzene extracted the largest quantity of esters, and the unsaponifiable fraction was most effectively removed by ethanol and by ethyl ether. *From author's summary.*

33.5. *Pit-props. Sleepers. Poles and Other Roughly Converted Wood*

[2620]. 33.51 (410). **Pit-props.** *Leafl. For. Comm., Lond.* No. 23 (revised), 1946. pp. 6.

A reprint, with minor alterations, of a leaflet first issued by the Forestry Commission in 1937. It deals with preparation of pit-props, marketing, dimensions of poles and props, tools, and costs.

[2621]. 33.52 : 12.26–8 (66.7). GOLD COAST. **Report on the Forestry Department for the year 1945-46.** Govt. Printing Department, Accra. 1946. pp. 8.

Of 891 sleepers laid on the Awaso line in 1943 for test purposes, only 21 had to be replaced during $2\frac{1}{2}$ years. Dahoma (*Piptadenia africana*) and Kaku (*Lophira alata* var. *procera*) were the most affected and Kosia (*Sarcocephalus diderrichii*) the least (p. 3).

[2622]. 33.52 : 32.26 : 33.36. **Report of committee 3—ties.** *Bull. Amer. Rly. Engng. Ass.* No. 451, 1945 (469–78). L.S.

Recommendations are made on the handling of railway sleepers from the moment of cutting. Time of cutting, proper piling during temporary storage, transport, inspection, conditioning, storage, preservative treatment, distribution, care during and after installation, renewals and salvage are dealt with. A brief report on the causes and control of splitting is included.

[2623]. 33.52 : 33.15.1 : 34.6. NICHOLS, W. K., JR. **Wood alone has strength and resiliency demanded in railway sleepers.** *B.C. Lumberm.* 31 (1), 1947 (75–6, 83).

The increasing demand for railway sleepers has led to the using of secondary species. In British Columbia, it has been found that Hemlock [*Tsuga heterophylla*] sleepers give excellent service provided that they are pressure-creosoted. Another new source of sleepers is provided by the sound cores of a veneer plant. These, being sawn on two faces, fall into the size specification for hewn sleepers, and present a uniform and favourable appearance. Coming from the heart of the log, they have few knots and are of high quality.

33.6. *Packing Boxes, Crates, etc.*

See also *For. Abstr.* 8 (Nos. 2496–7).

[2624]. 33.6. EADES, H. W. **Rusting of cans in wooden and fibreboard boxes.** *Mimeo. For. Prod. Lab. Dom. For. Serv.* No. 100–V, 1945. pp. 11.

It was found that rusting of cans stored in wooden boxes increased directly as the moisture content of the wood increased. Cans packed in wood below 17 per cent. moisture content, if they do rust, will rust only slightly. It is now the general practice in British Columbia to ensure that the moisture content of box shook material for canned goods does not exceed 16 per cent. There is definite indication that the moisture content of the wood, and not the species used, is the important factor in rusting.

33.8. *Other Manufactured Products*

See also *For. Abstr.* 8 (Nos. 2512, 2521).

[2625]. 33.8 (52). HEDGECOCK, R. H. **Woods, textiles, rubber, and plastics used in Japanese naval vessels.** *Brit. Intell. Obj. Sub-comm.* BIOS/JAP/PR/581, 1945. pp. 13. P.R.

The report contains a section on wooden parts in Japanese ships. A list is given of species and the constructions for which they were used.

[2626]. 33.8 : 33.15. KING, E. P. (to the De Havilland Aircraft Company). **Compressed wood structures for spars, struts, etc., for use in aircraft.** *Brit. Patent* No. 578,546, July 3rd, 1946. *Timber News* 54 (2088), 1946 (380). P.R.

The specification describes a method of reinforcing wood aircraft members in the area of joint contact with other components by the insertion of 'strong veneers' such as Ash, Hickory or Hornbeam between the laminae from which the member is built up. The strengthening inserts may be fibre sheets and other reinforcing materials used in a similar manner. Struts or other aircraft members strengthened in the way suggested may be made of natural wood, laminated and/or compressed wood.

[2627]. 33.8 : 12.25 (498). BOYER, M. L'industrie et le commerce du bois de résonance en Roumanie. [**The resonance wood industry and trade in Rumania.**] *Rev. int. Bois* 13 (114), 1946 (197). [F.]

Resonance wood is a superior quality of Spruce, which is quarter-sawn, eliminating the slightest defects, and used in making stringed instruments and the sound-board of pianofortes. This quality of Spruce is found in sufficient quantities for regular exploitation only in the centre of the Carpathians, where 6 to 10 per cent. of logs are suitable for this purpose. Only the butt log is used, and formerly only centenarian trees were cut. For the production of good logs, a minimum altitude of 600 m., a dense stand, a north aspect, and shelter from wind are necessary. Felling must be done in October, the logs brought down to the mills with the snow, and quarter-sawn in March. The branchwood also is used for the sound-boards of violins, etc., and for the keyboards of pianofortes. Germany was formerly the best customer for the keyboard wood, as French and English pianoforte manufacturers used Canadian Lime, which gives less waste. It takes 5 cu.m. of wood in the round to produce 1 cu.m. of planed resonance wood ready for use.

[2628.] 33.8 : 12.25–8 : 31. Essais sur l'emploi de diverses essences pour la fabrication des séparateurs d'accumulateurs. [**Experiments on the use of various species for making battery separators.**] *Rev. Bois Appl.* 1 (7/8), 1946 (30–1). [F.] P.R.

The laboratory of the French 'Institut National du Bois' made experiments on some French species and some American species grown in France to determine their suitability for use as battery separators. The species were classed according to their mechanical and chemical suitability as follows:—

	Chemical	*Mechanical*
Port Orford Cedar	1	2
Swamp Cypress	4	4
Redwood	3	3
Aspen	2	1
Poplar	5	5

[2629]. 33.8 : 12.25 : 32.81. TIKHOMIROV B. N. Kachestvo kedrovoy drevesinÿ dlya izgotovleniya akkumulyatornogo shpona. [**The quality of Siberian Pine wood for the manufacture of battery separators.**] *Lesnaya Prom.* No. 10/12, 1945 (12). [Russ.]

The woods indicated for this purpose in the standard Russian specification are Alder, Aspen, and Siberian Pine. The yield of I-grade battery-separator veneer from the last-named is low in any case and has been shown by investigations here reported to vary between 3 and 25 per cent., the chief defects influencing yield being knots and the presence of partial or complete annular zones of abnormally hard wood. Presence of occluding tissue or excentricity are much less important as defects. These and several lesser points are neglected by the specification, which should be emended.

[2630]. 33.8 : 12.25 : 12.26–8. CHEVEDAEV, A. A. Kleshchevaya bolvanka iz novÿkh porod. [**Hame blanks from new [substitute] woods.**] *Lesnaya Prom.* No. 10/12, 1945 (10–1). [Russ.]

The standard material for making hames in the U.S.S.R. has been the stump portion (with root spurs) of Birch, Maple, Ash, Elm and Beech. Most of these are in short supply and even Birch is scarce round some of the factories. Some use has been made during the war of artificially bent stemwood and laminated wood, neither of which can be an economical substitute, especially in view of the demand for them in other uses. The present paper reports on tests of the physical and mechanical properties (tabulated) of Aspen and Spruce stumpwood in comparison with that of Birch and Elm.

Judging from the results, Aspen should be completely suitable as a substitute. Spruce appears less satisfactory and could be used only if hame dimensions were somewhat enlarged, or for a lower-grade article. Both species have the advantage of being common and widespread, and no modification should be necessary in the technique of hame-making.

[2631]. 33.8 : 12.25 : 12.26–8. GRIMWADE, W. R. **Timbers for engraving blocks.** *For. Prod. News Lett. C.S.I.R. Aust.* No. 147, 1946 ([1]).

Huon Pine (*Dacrydium franklinii*) and Sandalwood (*Santalum spicatum*) from Australia were found to be suitable substitutes for Turkey Box in this use.

33.9. *Grading and Storage of Converted Timber*

See also *For. Abstr.* 8 (No. 2479).

[2632]. 33.91 (410) : 33.4. **Wood laths for plastering.** *Brit. Stand.* No. 1317, 1946. pp. 5. P.R.

[2633]. 33.91 (410) : 33.4. **Wood battens for slating and tiling.** *Brit. Stand.* No. 1318, 1946. pp. 5. P.R.

[2634]. 33.91 (410) : 33.4. **Fire-check flush doors (30-minute type).** *Brit. Stand.* No. 459, Part 3, 1946. pp. 9. P.R.

A specification is given for a type of flush door which will act as an effective barrier to the fire for 30 minutes. The design of the door and the required frame is illustrated.

[2635]. 33.91 (44) : 31.27. Qualités des bois et contraintes admissibles. **[Qualities of wood and permissible stresses.]** *Norme franç.* No. B52–001, Mar. 31st, 1946. pp. 10 + tbl. Association française de normalisation, 23 Rue Notre-Dame-des-Victoires, Paris. P.R.

[2636]. 33.91 (44) : 38. Règles d'utilisation du bois dans les constructions: règles de calcul: exécution des assemblages. **[Rules for the utilization of wood in buildings: rules for calculations: assembling.]** *Norme franç.* No. P21–202, Mar. 31st, 1946. pp. 18. [F.] Association française de normalisation, 23 Rue Notre-Dame-des-Victoires, Paris. P.R.

[2637]. 33.91 (73) : 33.4 : 33.15.1. **Rules for the measurement and inspection of hardwood lumber, Cypress, veneers and thin lumber.** National Hardwood Lumber Association, 59 East Van Buren Street, Chicago, 1946. pp. 104. P.R.

[2638]. 33.92 : 31.22.1 : 12.25. STEVENS, W. C., and HODGE, R. E. **Moisture changes in timber exposed to normal weather conditions.** *Timber News* 54 (2089), 1946 (400–2). P.R.

Tests were made at the Forest Products Research Laboratory, Princes Risborough, on the variations in moisture content of wood stacked in the open air and unprotected by a roof. Softwood boards at or near the top of an exposed stack are likely to reach a moisture content of 20 per cent. or even considerably higher within a few days in wet weather. Boards at the bottom of the stack are slower in absorbing moisture, but correspondingly slow in drying.

34. MINOR FOREST PRODUCTS AND THEIR UTILIZATION

34.2. *Vegetable Products*

34.21. Fodder Grass and Grazing

See also *For. Abstr.* 8 (No. 2416).

[2639]. 34.21 (54.8) : 97.3. WILSON, J. A. **Grazing management and improvement in Madras Province.** *Indian For.* 72 (12), 1946 (555–63). (7th Silvicultural Conference (1946), Dehra Dun.).

A resumé is given of the recommendations for a revision of policy on forest grazing in Madras Province made in 1938, together with results obtained from the working of the revised principles in North Coimbatore. Sections are included on the effect of the new policy on (1) the re-classification of forests; (2) regulation of grazing; (3) taungya developments; (4) hot-weather fodder supplies; (5) the artificial introduction of grasses; (6) improvement of water supplies in grazing grounds; (7) erosion control; and (8) research.

[2640]. 34.21 (75.6) : 97.3. SHEPHERD, W. O., KAUFMAN, C. M., and BISWELL, H. H. **Forest grazing in North Carolina.** *Sth. Lumberm.* 173 (2177), 1946 (228–38).

[2641]. 34.21 (77.5). AHLGREN, H. L., WALL, M. L., MUCKENHIRN, R. J., and SUND, J. M. **Yields of forage from woodland pastures on sloping land in Southern Wisconsin.** *J. For.* 44 (10), 1946 (709–11). [Wisconsin Agricultural Exp. Sta.]

Woodland pastures in the 15–25 per cent. and 26–35 per cent. slope classes produced average annual yields of 292 and 259 lb. of dry matter per acre, respectively, during the 5-year period 1941–45. Renovated and untreated open pastures produced annually an average of 3,210 and 1,453 lb., or 11·6 and 5·3 times as much forage per acre, respectively, as woodland pasture. Forage produced in shaded areas was observed to be less palatable to livestock than comparable forage in open, unshaded areas. Continued grazing of wooded areas on grey-brown podzolic soils in the northern part of the Mississippi valley cannot be recommended from the standpoint either of economical forage production or of efficient land use. *Authors' summary.*

34.23. Wood Ash. Potash

[2642]. 34.23 : 11.47.12 : 34.22. KANDIAH, S. **Manurial value of some agricultural waste products, wood ashes, sea weeds and water hyacinth.** *Trop. Agriculturist, Ceylon* 102 (1), 1946 (31–8). O.R.E.

Chemical analyses of various materials, including one of wood ash from the Ceylon Government Ceramic Factory, 15 fuel woods, 5 of *Casuarina* wood of different stages of growth, and 4 of wood waste from the Government Plywood Factory. The results are set out in tabular form.

34.24. Tanning Materials. Cork

[2643]. 34.24 (54) : 12.26–8 : 21.0. EDWARDS, M. V. **A note on the species of South Indian Wattles.** *Indian For. Leafl.* (*Chem. & minor For. Prod.*) No. 71, 1945. pp. 9.

Botanical descriptions of the three principal Australian Wattles [*Acacia decurrens, A. decurrens* var. *mollissima, A. dealbata*] which have been planted in South India, with notes on their distribution and use as sources of tan bark. [Cf. *For. Abstr.* 8 (Nos. 2295, 2365).]

[2644]. 34.24 (54) : 12.26–8. EDWARDS, M. V. **The vegetable tanning materials of India. Part II. Avaram** (*Cassia auriculata* **Linn.**). *Indian For. Leafl.* (*Chem. & minor For. Prod.*) No. 73, 1945. pp. 21.

A summary of information including botanical description, distribution, tannin content of bark, variation of tannin with age and part of the plant and the locality in which it grows, yield of bark, methods of collection, preparation for market, tanning properties, and manufacture of extract. Silviculture and by-products, including use as green manure, are briefly discussed. It is concluded that it is unlikely that cultivation would be an economic proposition. Proper marketing and probably grading are essential, and are the most important factors to be considered in making better supplies available for tanning. [Cf. *For. Abstr.* 8 (Nos. 568–9).] *From author's summary.*

[2645]. 34.24 (54) : 12.26–8. EDWARDS, M. V. **The vegetable tanning materials of India. Part IV. Myrobolan** (*Terminalia chebula* **Retz.**). *Indian For. Leafl.* (*Chem. & minor For. Prod.*) No. 75, 1945. pp. 19.

This compilation summarizes available information on Myrobolan, the fruit mainly of *Terminalia chebula*, its varieties and allied species. Details are given of the areas where it is obtained, the tannin analysis and variations in tannin content with the time of collection of the fruit, its shape, colour, structure, and proportion of flesh to stone. Some data on the yield of fruit per tree are given, and methods of collection and preparation for market, including crushing and grading, are discussed. Tanning properties and manufacture of extract are noted. It is considered that, in order to fill the gaps in our knowledge of Myrobolan, a full field, laboratory, tanning and statistical investigation must be made. *From author's summary.*

[2646]. 34.24 (54.2) : 12.26–8. PALIT, A. P. **Indigenous tanning.** *J. sci. industr. Res., India* 5 (1), 1946 (33). I.H.

An account of tanning methods used at Barang, near Cuttack, the manufacturing centre of the famous *Katki Chatties* and Mahratta shoes. For preliminary tanning an infusion from powdered leaves of *Memecylon edule* is used and for final tanning, bark of *Cleistanthes collinus*. Elsewhere leaves or fruits of *Phyllanthus emblica, Terminalia chebula, Entada pursitha*

and *Cassia fistula* are used for preliminary tanning, and barks of *Elaeodendron glaucum* and Sahaja [*T. tomentosa*] for final tanning. The composition of the tanstuffs of the bark of *C. collinus*, the fruit or pods of *E. persitha* and the leaves of *M. edule* is given.

[2647]. 34.24 : 12.26–8 : 01.6 : 2. WATROUS, R. C., and BARNES, H. V. [Compilers]. **Bibliography on Cork Oak.** *Bibliogr. Bull. U.S. Dep. Agric.* No. 7, 1946. pp. 66.

This bibliography includes references to the literature on the Cork Oak and its culture, the stripping, treatment, and properties of cork, and the cork industry and trade of various countries. Material dealing exclusively with the manufacture of cork products is omitted. The scope of each item is indicated by annotations. [Cf. *For. Abstr.* 8 (No. 2395).]

34.25. Medicinal Plants

[2648]. 34.25 : 12.26–8 : 12.11.11 : 34.26 : 34.27. **Utilization of Nim oil and its bitter constituents (nimbidin series) in the pharmaceutical industry.** *J. sci. industr. Res., India* 5 (1), 1946 (29–32). I.H.

A series of new crystalline and amorphous bitter constituents have been isolated from Nim oil. The main active principle, nimbidin, is a straw-coloured, water-insoluble granular product of neutral character. Nimbidinic acid is obtained from it. Pharmacological studies have resulted in the production of tinctures, ointments, medicinal cosmetics, tooth pastes, gargles, etc., containing nimbidin. A list of these preparations with the estimated cost of production is given. An analysis of the constituents of Nim oil and their properties is included. If full use is made of the various fractions of the oil, the cost of one kg. of nimbidin is about Rs.48, excluding the cost of containers, overheads and supervision.

[2649]. 34.25 : 12.26–8 : 34.26. PÉTARD, P. Nouvelles utilisations de l'huile de *Calophyllum inophyllum*. II. L'huile de Tamanu et son emploi dans le traitement de la lèpre. [**New uses for the oil of *Calophyllum inophyllum*. II. Oil of Tamanu and its use in the treatment of leprosy.**] *Rev. int. Bot. appl.* 26 (283/284), 1946 (202–12). [F.] P.R.

[2650]. 34.25 : 12.26–8 : 21.0. LENGAUER, L. **Ossiomo leper settlement.** *Farm and Forest* 7 (1), 1946 (41–4).

The first attempt to grow *Hydnocarpus wightianus* at this settlement was made with transplants from a forestry station, which all died. In the following year seed was sown in two nurseries, one shady and damp near the river, the other more open and rather dry. The seeds on the river site germinated but soon died; those on the dry site grew into healthy seedlings, but died when transplanted at 2–3 ft. high. In the 3rd year of the experiment, seed was sown directly on abandoned farm land and this was very successful. When the seedlings were about 1 ft. high, they had to be protected against browsing by little hedges of sharp sticks. An insect pest was stopped by sprinkling each seedling with native tobacco solution. At present (about 7 years after sowing) there is a plantation of over 1,000 trees. The only treatment has been periodic weeding and cleaning. The trees have grown very well and are fruiting nearly the whole year round; one tree gives an average of 300–400 fruits in January. The oil, which is extracted in an ordinary palm-oil press, and used in the treatment of leprosy, has been analysed and proved to be better than that imported from India.

[2651]. 34.25 : 12.26–8 (67.6) : 21.0 : 76 : 2 : 47. THOMAS, A. S. ***Cinchona* in Uganda.** *Emp. J. exp. Agric.* 14 (54), 1946 (75–84 + plate). [Department of Agriculture, Uganda.] O.R.E.

Includes information on the selection of high-yielding stock, the climatic and soil requirements of *Cinchona* spp., cultivation, pests and diseases, and costs, yields and returns.

The future of *Cinchona* planting in Uganda is very uncertain owing to the large reserves of *Cinchona* bark now available from Java and the increasing use of synthetic drugs to combat malaria. However, the existing plots show that with the relatively low costs of planting in Uganda, the excellent growing conditions, the good strain of seed available, and the high yields, especially after manuring, *Cinchona* production should be as economical in Uganda as in any other country.

[2652]. 34.25 : 12.26–8 (729.5) : 21.0 : 23.24. HARPER, R. E., and WINTERS, H. F. **Cinchona investigations in Puerto Rico.** *Agric. in Americas* 6 (2), 1946 (30–2, 37).

The first attempts to introduce *Cinchona officinalis* and *C. pubescens* into Puerto Rico were unsuccessful, but the latest trials on a new site in the Toro Negro National Forest, in a protected valley at 3,000 to 3,550 ft. where a granitic sandy loam soil occurs, have resulted in the establishment of four acres of field plantings. Indications are that this will be a successful area for the growing of Cinchona in Puerto Rico. Details are given of methods adopted for special protection of seedlings in the early stages, preparation of nursery beds, nursery planting, field planting, and protection against insects and disease.

[2653]. 34.25 : 12.26–8 : 34.27 : 12.11.11. ASENJO, C. F., and GUZMÁN, A. R. F. DE. **The high ascorbic acid content of the West Indian Cherry.** *Science* 103 (2669), 1946 (219). D.S.I.R.

The fruit of the West Indian Cherry (*Malpighia punicifolia*) contains 1,000 to 3,300 mg. of ascorbic acid per 100 g. of edible matter, the variation in content being due principally to the degree of ripeness. The richest natural sources of ascorbic acid known to date, viz. *Rosa* spp., *Phyllanthus emblica*, and *Psidium guajava*, contain about 1,700, 800 and 300 mg. respectively of ascorbic acid per 100 g. of edible matter. The method used for isolating the acid from the fruit is briefly described.

[2654]. 34.25 : 12.26–8 : 34.27. SHMUK, A., and ZAMÝSLOV, A. Yagodý ryabiný kak sýr'e dlya polucheniya karotina i karotinovýkh preparatov. [**Rowan berries as a source of carotin and carotin preparations.**] *Doklad. vsesoyuz. Akad. sel'sk.-khoz. Nauk im. V.I. Lenina* 10 (4/5), 1945 (7–10). [Russ.] A.P.B.

Being common and widespread, and having berries that keep well on the tree up to the time of the frosts, Rowan (*Sorbus aucuparia*) is a valuable potential source of vitamins. The berries contain 45–60 mg. per cent. of vitamin C and their juice is considerably richer, but special measures must be taken to ensure the keeping qualities of such preparations. The high carotin content (about 10–12 mg. per cent. in fresh berries) is almost entirely active β-carotin. The pulp, after removal of juice, contains up to 80 mg. per cent. carotin (pro-vitamin A). Preparations may be made from fresh, shrivelled or dried berries, but as carotin is not thermo-stable, drying temperatures should not exceed 60° C. Dried berries yield only carotin preparations and no vitamin C. The various forms which such carotin preparations may take are briefly described.

34.26. Resin. Turpentine. Oils. Gums. Rubber. Latex. Dyestuffs

See also *For. Abstr.* 8 (Nos. 2332, 2648–50).

[2655]. 34.26 : 12.25 : 12.11.16 (75.9). OSTROM, C. E., and WARING, W. **Effect of chemical stimulation of gum flow on carbohydrate reserves in Slash Pine.** *J. For.* 44 (12), 1946 (1076–81). [Southeastern Forest Exp. Sta., Lake City, Fla.]

Samples of the inner bark of roots and stems of Slash Pines [*Pinus caribaea*] were collected in October and November to determine the effect of acid treatment upon reserve carbohydrates, including sugars, starches, and their intermediates. Trees tapped for 5 years had significantly lower quantities of reserve carbohydrates in bark of root and stem than had trees which had not been tapped for 9 years. Trees tapped for one year without treatment and then for 4 years with application of sulphuric or hydrochloric acid solutions (20–40 per cent. by weight) were intermediate in respect of carbohydrate level. The acid-treated trees had a greater weight of inner bark per sq. in. of root surface than untreated, tapped trees, and also a significantly higher content of carbohydrates per sq. in. Stem bark showed the same differences but in a less degree. No explanation for the higher food reserve of acid-treated trees is known. The results demonstrate that acid treatment did not cause an impoverishment of food reserves in root and stem bark of tapped trees, even though a higher yield of resin resulted from the treatment. *From authors' summary.*

[2656]. 34.26 : 12.25 (54). GHATAK, N., and MITRA, S. P. **Manufacture of abietic acid from Indian rosin.** *J. sci. industr. Res., India* 4 (10), 1946 (653). D.S.I.R.

In an attempt to find a more economical method of manufacturing abietic acid from rosin of *Pinus longifolia*, the rosin was treated with high-temperature steam. Up to about 200° C. only a little oily liquid distilled over. The steam-treated rosins were pale in colour and crystals of abietic acid separated out easily

from 90-per-cent. ethyl-alcohol solution. On progressively raising the temperature of the steam above 200° C. a yellow solid product began to distil over. On exhaustive distillation about 60 per cent. of yellow transparent solid material was obtained, which was found to be practically pure abietic acid. It is thought that these two methods would provide a means of producing abietic acid cheaply.

[2657]. 34.26 : 12.25 : 07.7 (43.6). MAZEK-FIALLA, K. Neue Harzungsverfahren. [**New methods of resin-tapping.**] *Intersylva* 3 (1), 1943 (28–45). [G.g.e.span.f.it.]

With chief reference to the Austrian resin-tapping industry and especially to two new tools (figured) employed in the Niederdonau-Wien forest district, viz.:—(i) The 'Wiener Hobel', for furrow cutting, consisting of a wooden body and handle and having a central guide-piece to each side of which is fixed a V-shaped cutter. A cut can be made by pushing or pulling, according to convenience, and the guide-piece keeps successive cuts parallel. This tool is designed chiefly for Scots Pine, as Austrian Pine appears to give lower yields from furrow cuts than from surface blazes. (ii) The 'Piestinger Hobel' has one broad blade for taking off a broad, thin shaving in a single light stroke. A scraper is also fitted for cutting and renewing the two oblique collecting channels at the bottom of the face. This tool is effective only with Austrian Pine or allied species for which a superficial cut gives the best results.

Before using either tool, the outer bark must be removed to leave a layer only 3–4 mm. thick and as uniform as possible, an operation which is done by a special stirrup-shaped shave ('*Bügelschaber*' or '*Röteleisen*').

Earthenware, glass, or plastic cups are used: those for Austrian Pine hold about 1 kg. and are emptied only when full (after about 8 incisions); those for Scots Pine are smaller and are emptied at each fresh cutting. Earthenware or cardboard lids are used to keep out impurities. The method of working is described with special reference to Austrian Pine.

[2658]. 34.26 : 12.25 (44). LOMBARD, R. Les produits résineux: richesse nationale. [**Resinous products: national wealth.**] *Rev. Bois Appl.* 1 (9–10), 1946 (7–10, 39). [F.] P.R.

France is one of the biggest world producers of resin, turpentine and rosin, most of which originates in the Pine forests of the Landes, although some comes also from Provence. In the Landes, Pines are blazed for resin from the age of 30 years to about 80 years, first with one face and later with two, and they yield an average of 1·5 to 2 litres per face per season. Annual production of resin in France before the war was 1 million hectolitres. It is usually processed to produce turpentine and rosin in factories near its place of origin. Before the war French annual production of turpentine was about 20,000 tons and of rosin 70,000 tons. A brief summary of the constitution and commercial uses of these products is given.

[2659]. 34.26 (944) : 01.7 : 96.5. [BRYANT, L. H.] **Trends in essential oil research and development.** *Aust. Timb. J.* 12 (8), 1946 (459, 461).

It is suggested that oil-assessment surveys might well be correlated with timber surveys. It is necessary to know the weight of foliage per unit area, the yield of oil, the type of oil, and the price that could be obtained for it. It is necessary to study the optimum rotation for oil-yielding plants and to determine whether some of them could be made to grow on land useless, or practically useless, for sheep. Oil-yielding trees and plants can be used to combat soil erosion, as farm shade and as shelterbelts.

Sampling presents difficulties. It is necessary to ensure that the sample taken of leaf material be representative of the leaf material as a whole; wood occurring with the leaves must be eliminated, also very young and very old leaves. More delicate apparatus and better application of statistical analysis are the main requirements of research in this field.

[2660]. 34.26 : 12.26–8 (69). COSGROVE, D. J., and ISLIP, H. T. **Cinnamon bark oil from Seychelles.** *Bull. imp. Inst.* 44 (3), 1946 (188–204).

It appears, from the examination of samples of Cinnamon bark from the Seychelles, that the chief obstacle to the production of an oil conforming to the requirements of the British Pharmacopoeia is a deficiency of eugenol in the oil compared with the Ceylon product. This difference may be due to climatic and soil conditions, or to the difference in age of the two barks when distilled. It is known that the Seychelles Cinnamon leaf oil is richer in eugenol and poorer in cinnamic aldehyde than

the corresponding oil from Ceylon, and as no question of differing ages of leaves arises here, the indication is that a different balance of the eugenol and cinnamic aldehyde as between leaf and bark may be a natural result of different conditions of growth in the two places.

[2661]. 34.26 : 12.26–8 (68.9) : 21.0 : 12.11.22 : 11.47.1 : 12.11.21 : 2. WEBSTER, C. C. **The cultivation of the Tung tree in Nyasaland.** *Emp. J. exp. Agric.* 14 (53), 1946 (18–24). [Tung Exp. Sta., Department of Agriculture, Nyasaland.] O.R.E.

[2662]. 34.26 : 12.26–8 (69) : 23.2. CHAMPENOIS, C. La culture de l'*Aleurites fordii* ou Tung à Madagascar. [**The cultivation of *Aleurites fordii* or Tung in Madagascar.**] *Rev. int. Bot. appl.* 26 (281/282), 1946 (95–100). [F.] P.R.

[2663]. 34.26 : 12.26–8 : 12.11.1 : 42.5. GILBERT, S. G., SELL, H. M., and DROSDOFF, M. **The effect of copper deficiency on the nitrogen metabolism and oil synthesis of the Tung tree.** *Plant Physiol.* 21 (3), 1946 (290–303). [U.S.D.A. Field Lab. for Tung Investigations, Gainesville, Fla.] O.B.D.

[2664]. 34.26 : 12.26–8. EISENSCHIML, G. **Changes in wood oil and Tung oil on prolonged storage.** *Paint Oil chem. Rev.* 109 (7), 1946 (16, 18). L.S.

[2665]. 34.26 : 12.26–8 : 34.27. **Candlenut oil.** *Chem. Tr. J.* 119 (3091), 1946 (194). D.S.I.R.

Candlenut oil (from the seeds of the widely distributed *Aleurites moluccana*) belongs to the linoleic acid class of oil typified by linseed oil. Investigations on oil from Australian trees gave the following constants: Specific gravity, 25°/25°, 0·9250; specific gravity 15°/15°, 0·9310; acid value, 7·3; saponification value, 194; iodine value (Wijs), 174; refractive index D (at 15° C.), 1·4815. The rate of thickening on heating, as well as the rate of drying, and the water permeability of the dried film, are of the same order as for linseed oil.

Seed from Australian trees produced 67 per cent. shell and 33 per cent. kernel. The kernels contained 56 per cent. oil. It is considered that in Australia, Candlenut oil could be produced at a cost of between 4*s*. and 5*s*. per gallon. The possibility of production in Fiji is mentioned.

[2666]. 34.26 : 12.26–8. PURANEN, U. H. **Obtaining saponifiable substances and fatty acids from Birch bark.** *Swed. Patent* No. 106,556, Feb. 16th, 1943. Chem. Abstr. 40, 1946 (7668–9). P.R.

Birch bark, with or without preliminary separation of betulin and saponins, is hydrolysed, and the product, which is substantially freed from saponins, is further treated, e.g. by means of an alkali solution, to produce a soap or a free fatty acid.

[2667]. 34.26 : 12.26–8 (81). JAMIESON, G. S. **The Oiticica tree of Brazil and the oil from its seeds.** *J. N.Y. bot. Gdn.* 47 (562), 1946 (243–6).

Since 1939, following years of large seed crops, the annual production of Oiticica oil has at times amounted to nearly 15,000 metric tons. As a result of investigations carried out on the Paraíba experiment station, thousands of seedlings are now being budded with buds taken from high-yielding mature trees, for setting out in plantations. An attempt to grow *Licania rigida* in the southern part of Florida was unsuccessful.

[2668]. 34.26 : 12.26–8. GANGULY, S. C., HOSSAIN, T., and MUKERJI, B. **'Ghatti gum' as an emulsifying agent.** *Indian J. Pharm.* 7 (4), 1945 (106–8). L.S.

'Ghatti gum', from the stem of *Anogeissus latifolia*, was compared with gum of *Acacia senegal* and *A. arabica*. It has little or no emulsifying power and very poor solubility in water, and is not recommended as a substitute for gum of *A. senegal*. Indian Acacia, however, obtained from *A. arabica*, is a good substitute and has even better emulsifying power than gum of *A. senegal*.

[2669]. 34.26 : 12.26–8 : 12.11.11. BEAUQUESNE, L. Sur la gomme de *Sterculia*. [***Sterculia* gum.**] *C.R. Acad. Sci., Paris* 222 (18), 1946 (1056–8). [F.] D.S.I.R.

The principal constituents of *Sterculia* gum are galacturonic acid (43 per cent.), galactose (14 per cent.) and rhamnose (15 per cent.). It has a high uronic content and offers great resistance to hydrolysis.

[2670]. 34.26 : 12.26–8 (66.9). SMITH, J. **Recent wild rubber production in the Cameroons.** *Sylva, Edinb.* No. 27, 1946–47 (33–4, 36).

An account of the organization and methods of tapping rubber-producing lianes during the war. The vines were tapped to death in a single operation.

[2671]. 34.26 : 12.26–8. CHEVALIER, A. Le *Cryptostegia* et les *Mascarenhasia* comme producteurs de caoutchouc. [***Cryptostegia* and *Mascarenhasia* as rubber-producing plants.**] *Rev. int. Bot. appl.* 26 (281/282), 1946 (130–3). [F.] P.R.

[2672]. 34.26 (728.1). HAHN, F. L. Colorantes vegetales de Guatemala. [**Vegetable dyes of Guatemala.**] *Ciencia, Méx.* 6 (10/12), 1945 (385–91 + plate). [Span.]

34.27. Seeds. Fruits. Leaf Fodder

See also *For. Abstr.* 8 (Nos. 2645–6, 2653–4, 2661–5, 2667).

[2673]. 34.27 : 12.26–8 : 12.11.11. TUMMIN-KATTI, R. L., ALIMCHANDANI, R. L., and CHANNAPPAGOWDER, B. B. **Chemical examination of the seeds of *Jatropha curcas*. Linn.** *J. Univ. Bombay* (*n.s.*) (*Sci. No.*) 14 (3) (Sect. A, No. 18), 1945 (34–6). L.S.

Seeds of *Jatropha curcas* contain a fatty oil, two different phytosterols, a phytosterolin, besides a large amount of sucrose and resinous matter having marked physiological (nauseating, purging and griping) properties. From the glycerides of unsaturated acids in the fatty oil only oleic and linoleic acids were found. No other acid similar to ricinoleic or curcanoleic acids could be isolated as claimed by some of the previous workers. *Authors' summary.*

[2674]. 34.27 (94) : 12.26–8. EARDLEY, C. M. **Tree legumes for fodder.** *Repr. from J. Agric. S. Aust.* 48, 1945 (342–5).

Notes on *Ceratonia siliqua*, *Gleditschia triacanthos*, and *Prosopis juliflora* and their suitability as supplementary fodder for stock in South Australia. The first two species are excellently suited for this purpose in the better southern districts. *Prosopis* should be given a trial in the more arid grazing areas both as a fodder plant and for combating soil erosion.

34.28. Bamboos

[2675]. 34.28 : 12.29 (52) : 09.4. **Production, consumption and stockpiles of Bamboo. (A preliminary compilation).** *Brit. Intell. Obj. Sub-comm.* BIOS/JAP/PR/681, 1946. pp. 13 + tbls. P.R.

The production, consumption and distribution of Bamboo for domestic uses and as a source of food in Japan was investigated. Tables and diagrams show production and consumption by prefectures for 1944 and 1945, and stock volume for 1945. Consumption of Bamboo in 1944 exceeded production by $4\frac{1}{2}$ million bundles, but the 1945 production exceeded consumption by nearly 3 million bundles. Present shortages in large cities are due mainly to lack of transport. Of the 386,000 acres on which Bamboo is grown in old Japan, 92 per cent. is privately owned in small holdings. An analysis of types of owners and numbers of acres owned by them is given. Tables also give selling dimensions and sale prices.

[2676]. 34.28 : 12.29 (86). MCCLURE, F. A. **Bamboo in Ecuador's highlands.** *Agric. in Americas* 6 (10), 1946 (164–7). A.P.B.

Highland Bamboos in Ecuador, chiefly belonging to the genus *Chusquea*, occur most abundantly in humid areas between 5,000 and 11,000 ft. Many highland species lack strength and durability, but are used locally for walls and sheathing and for the weaving of baskets and hats. The group known as *moya*, having stronger and more durable culms, is used to make ladders, fences and rafters. Some commercial establishments are making furniture of native Bamboo. Experimental planting of two oriental species, *Phyllostachys aurea* and *P. bambusoides*, have been made with some degree of success. [Cf. *For. Abstr.* 8 (No. 617).]

34.3. *Products of the Animal Kingdom*

[2677]. 34.3 : 13.2 : 91.1 : (43.1–5). GÖSSWALD, K. Einwirkung des Puppensammelns bei den verschiedenen Waldameisenarten. [**Effect of the collection of pupae of various species of forest ants.**] *Z. angew. Ent.* 30, 1944 (317–35). [G.] [Institut für Waldschutz, Eberswalde.]

The collection of ants' eggs (pupae) in German forests as food for cage birds, etc., is condemned. The author discusses and disposes of the arguments which attempt to justify unregulated collection and maintains that any reduction of the ant population in a forest is

harmful. *Formica rufa* can easily be reared artificially and the trade might well be supplied from 'ant farms' instead of from the forest.

35. SALE AND DISPOSAL OF FOREST PRODUCTS. TIMBER TRADE

[2678]. 35 (4) : 98.3. GONGGRYP, J. W. L'importation du bois des tropiques en Europe. [**The import of timber from the tropics into Europe.**] *Intersylva* 2 (2), 1942 (241–56). [F.g.e.it.span.]

The export statistics of French Equatorial Africa and the import statistics of Great Britain, France and Germany are considered. Exports of tropical timbers to Europe are estimated at 1 million cu.m. per year, and to countries outside Europe at about the same amount.

[2679]. 35 (410) : 09.4. **Monthly Digest of Statistics, No. 13, 1947.** pp. iv + 119. **Definitions of Items and Units in the Monthly Digest of Statistics.** Revised Jan., 1947. pp. 36. H.M. Stationery Office, London.

[Cf. *For. Abstr.* 8 (No. 1360).]

[2680]. 35 (46) : 09.4. SPAIN. Información comercial y estadistica: síntesis de un año de comercio exterior. [**Commercial and statistical data: summary of a year of foreign commerce.**] *Montes, Madrid* 1 (2), 1945 (74–5). [Span.] I.M.I.

Includes export figures for various categories of wood and wood products from the south-southwestern zone of Spain in 1943 and 1944.

[2681]. 35 (47.1) : 98 : 09.4. FINLAND. Ulkomaankauppa. Vuosijulkaisu 65, 1945. [**Foreign commerce. Annual report 65, 1945.**] Suomen Virallinen Tilasto, Helsinki. (I.A.) 1946. pp. 246. [Fi.Sw.f.]

[2682]. 35 (59.5) : 98. DANHOF, G. N. De houthandel te Singapore na den oorlog. [**The Singapore timber trade after the war.**] *Tectona* 36 (5), 1946 (282–8). [Du.e.]

An account of the relations existing between producers, importers and sawmill owners in the post-war period. Causes of the present high prices for logs of $50–60 per ton are discussed: it is expected that prices will remain high as long as the high cost of living prevails, and in future, even if there is a general decrease in the cost of goods, trade-union activity may prevent timber prices from dropping below about twice those of 1941. It is thought that the Government's best course lies in trying to reconcile the different interests and to regulate prices so far as possible without actual interference. *From author's summary.*

[2683]. 35 (71.1) : 90. GILMOUR, J. D. **Cultivated forests and British Columbia's lumber markets.** *B.C. Lumberm.* 30 (10), 1946 (49–50, 64, 66, 100, 102, 104, 106, 108, 110).

The main part of the article consists of a fairly detailed review of the increase in plantation-grown timber production in countries (mainly in the Southern hemisphere) which are some of the principal customers for British Columbian timber. Rates of growth, lengths of rotation, areas of plantation, and planting objectives in New Zealand, Australia, South Africa, and parts of South America are compared with those in British Columbia. It is concluded that if British Columbian timber is to continue to compete in these markets, Government policy must change. The idea of an inexhaustible source of revenue is based on the returns in the past from virgin forest. Second-growth forest can never provide crops of the same quality, and will, moreover, require considerable expenditure for protection. In these circumstances, the present final-yield tax of 12½ per cent. is a crushing burden to the industry.

[2684]. 35 (81) : 98.3. Exportação de madeiras 1939–45. [**Exports of timber 1939–45.**] *Brasil madeireiro* 2 (17), 1946 (6–7). [Port.]

Pincho [*Araucaria angustifolia*], Imbuia [*Phoebe porosa*], Cedro [*Cedrela* spp.], Aguano [*Swietenia macrophylla*], and Jacarandá [*Machaerium* spp.] constituted about 98½ per cent. of the total value of timber exported from Brazil in 1945. Owing to the war, exports of Pine in 1945 amounted to only 238,530 tons as against 307,794 tons in 1939. Data are given on the tonnage and value of exported timbers of the five species mentioned above in the 1939–45 period.

[2685]. 35 : 09.4 : 98 : 33.38 (45). Holzbilanzen—Vorträge, gehalten am 10 Sept. 1942 anlässlich der VI. Komiteesitzung der Internationalen Forstzentrale zu Wien. [**Timber balances—lectures held on 10 Sept. 1942**

at the 6th session of the Committee of the Centre International de Sylviculture at Vienna.] *Silvae Orbis* No. 6, 1942. pp. 90. [G.]

The text of 5 lectures: (i) *J. Köstler's* general introductory lecture on the need for preparing timber balances for forest regions, countries and continents. (ii) *G. Luncz* on timber price levels and variations. (iii) *W. Junghans* on statistical methods in preparing timber balances. (iv) *F. Kollmann* on technical measures (improvements in utilization) for the amelioration of timber balances. (v) *L. Moser* on wood carbonization, with special reference to Italy.

[2686]. 35 : 32 : 46 : 82. BÅNG, F. Skall man sälja skogsavkastningen på rot eller upphuggen? **[Should timber be sold on the stump or converted?]** *Skogen* 34 (3), 1947 (45). [Sw.]

When clear felling was prevalent in Sweden, sale of timber on the stump was a less harmful practice than to-day, when most of the timber is derived from intermediate fellings, and much damage may be done in felling and extraction by persons with no permanent interest in the forest. Permanent occupation for forest workers, and consequently the building up of a body of skilled labour, is also unlikely when timber is sold on the stump, and casual labour will usually involve damage of various kinds. Sale of timber already converted, besides reducing damage from the causes mentioned, puts measurement and valuation on an objective basis and enables the forest owner to make the best of his material by skilful cutting up into the most advantageous range of assortments.

38. CONSTRUCTIONAL WORKS. ENGINEERING

38.2. *Building Construction. Foundations and Superstructures*

See also *For. Abstr.* 8 (Nos. 2461, 2514–5, 2632–6).

[2687]. 38.2. CAMPREDON, M. J. Progrès récents en matière de construction en bois. **[Recent developments in timber construction.]** *Circ. Inst. tech. Bâtim. Trav. publ., Paris (Sér. H.)* No. 19, 1946. pp. 10. [F.] P.R.

A general summary of world research on processing wood for constructional works, and a short account of modern types of construction.

[2688]. 38.2 (213). DESCH, H. E. **Construction of timber buildings in the tropics.** *Crown Colonist* 16 (180), 1946 (781–5). O.G.

A timber building properly constructed of sawn, seasoned timber may last 50 years or more, even under tropical conditions. Many even of the less durable species of timber, if properly used, have an economic life of 25–50 years, and this may be all that is required of them. Buildings, like machinery, are liable to become obsolete, especially in the tropics, so that the less expensive timbers, with a restricted life, are often more economical to use than those that last indefinitely but are initially more costly. Fungal activity can be eliminated by using only seasoned timber, providing adequate ventilation and avoiding constructional defects that lead to imperfect run-off of rainwater. Termite attack can be reduced to a minimum by raising a building on a concrete foundation (against subterranean termites), and avoidance of sapwood. The details of these measures are discussed and illustrated by plans and drawings of typical bungalow and other buildings.

[2689]. 38.2 : 82. GRANLUND, T. Ny typ av rastkoja. **[New type of rest cabin [for forest workers].]** *Skogen* 34 (2), 1947 (26–7). [Sw.]

Illustrated description of a readily portable rest cabin to shelter 4–5 or sleep 2–3 men. The timber frame has bolted joints wherever necessary for dismantling and re-erection, and is covered with impregnated paper, canvas or tarpaulin. There is a stove on which food can be heated.

38.3. *Road and Bridge Construction*

[2690]. 38.3. VORONOV, M. A. Ledyanoy most. **[An ice bridge.]** *Lesnaya Prom.* No. 10/12, 1945 (13–4). [Russ.]

Devised for use early in the season, to save time when the river ice is not yet thick enough to take tractor-drawn timber sledges.

A track is marked out on the ice in a suitable place and is provided with two triangular-section snow 'kerbs', 5 m. apart and each 1 m. wide (total road width 7 m.). For a width of 15 m. outside each kerb it is desirable to remove or tamp down the snow with sledges. A tractor with tank and water-pump stands on the bank and pumps water to form the track

between the kerbs, and when the ice is thick enough (35–50 cm.), moves out to the middle and completes the icing of the other half of the track. Fuelwood logs can be frozen into the track if desired.

With ice 45–50 cm. thick between the kerbs and 25–30 cm. thick elsewhere, a total load of up to 36 metric tons could be taken across without cracking the ice.

38.6. *Drainage*

[2691]. 38.62 (47.1) : 11.49.5 : 12.19.2 : 12.19.3 : 23.3. LUKKALA, O. J. Über Moore und Waldentwässerungstätigkeit in Finnland. **[On wet peatlands and forest drainage operations in Finland.]** *Intersylva* 4 (1), 1944 (14–32). [G.g.e.span.f.it.]

About 11·2 million ha. (32 per cent.) of Finland is wet peatland, of which 28 per cent. is good and 31 inferior forest land, 37 is waste and 4 is natural meadowland and cultivated land. About 48 per cent. of the peatland is privately and about 42 state-owned. The origin and development, empirical classification by cover types into more or less wooded bog/fen transitions, 'suffrutex' bogs, *Sphagnum* bogs and 'brown-moss' fens [cf. *For. Abstr.* 8 (No. 1610)] and subtypes, suitability for drainage (assessed by cover types plus a climatic zoning, and finally decided by peat and subsoil sampling and any physical limitations to drainage), planning of draining projects, initial and maintenance work, effects of drainage, organization and results to date, treatment and afforestation of drained land, and education and research in forest drainage, are briefly discussed. A total of 650,000 ha. has so far been drained. [Cf. also *For. Abstr.* 8 (No. 2695).]

4. FOREST INJURIES AND PROTECTION

42. INJURIES FROM INORGANIC AGENCIES, EXCLUDING FIRE

42.1. *Air Currents*

[2692]. 42.1 (69). MAURITIUS. **Annual report of the Forest Department, 1945.** Govt. Printer, Port Louis. 1946. pp. 13.

The cyclones which struck the islands early in 1945 and caused widespread destruction of Pine plantations [cf. *For. Abstr.* 8 (No. 651)] were still having after-effects at the end of the year. Chinese Pine, in particular, continued to die in stands which at first appeared not to have suffered. Plantations of *Casuarina equisetifolia* have suffered so severely that it will be necessary to clear-fell them. The cyclones uprooted more than 50 per cent. of the growing stock, and since then another 30–40 per cent. of the remaining standing trees have died. *Cinnamomum camphora* and *Cryptomeria japonica* sustained least damage (pp. 1–3).

[2693]. 42.1 (74.7). GRAVES, A. H. **Damage to trees in New York City in the hurricane of September 14th, 1944.** *Torreya* 44 (3), 1945 (66–73). [Brooklyn Botanic Garden, Brooklyn, New York.] K.

42.2. *Temperature Influences*

[2694]. 42.21 (41.1–4) : 21.0. HUNTER BLAIR, SIR H. **Frost damage to woodlands on Blairquhan estate in April, 1945.** *Scot. For. J.* 60 (1), 1946 (38–43).

Notes on damage caused by a severe frost (16°) following a mild winter and spring. The most extensive damage occurred in plantations of Sitka Spruce. Damage varied from complete destruction to crippling; though most severe in frost hollows, it also occurred on sloping ground and even on knolls. Damage was most severe in the young plantations but is also apparent in trees up to 40 ft. high and 20 years old. Norway Spruce suffered much less, and *Picea omorika* was even more frost-hardy. *P. asperata* survived with few losses; specimens of *P. orientalis* and *P. breweriana* were uninjured. Scots Pine, Corsican Pine, *Pinus strobus*, *P. peuke* were undamaged, *P. contorta* slightly damaged. Mortality in *P. monticola* amounted to 100 per cent. Silver Fir was cut back, but no deaths have been noted. *Abies nobilis* and *A. lowiana* appear to be hardier than *A. grandis* and *A. amabilis*. Most of the Chinese and Japanese Firs suffered severe damage, an exception being *A. veitchii*. The European, Japanese and Hybrid Larches suffered fairly severe damage. *Larix laricina* was not affected, though planted in swampy hollows. It has been possible to make a decisive comparison of Japanese and Hybrid Larches. In three separate places they were growing side by side in similar conditions, and losses among Japanese Larch were in each case much heavier than those among Hybrid Larch: in a newly made plantation the estimate for beating up is, Japanese Larch 70 per cent., Hybrid Larch 16 per cent. In 1940 a small plantation of Hybrid Larch was formed, trees with yellow twigs in a separate plot from those with red twigs. Frost damage was more severe among the latter. *Larix olgensis*, which has been cut back every spring since it was planted, has suffered further damage. The younger trees of *Thuja plicata* and *Tsuga heterophylla* were destroyed almost 100 per cent. and the older trees crippled or cut back in the same proportion. *Thuja occidentalis* and *Tsuga canadensis* appear not to have suffered. Thus, in the case of these genera, as with White Pines, Spruces and Silver Firs, trees from the Eastern seaboard of America proved hardier than those from the West. *Sequoia gigantea* did not suffer much loss, but *S. sempervirens* is a 100-per-cent. loss so far as young trees are concerned. A notable exception to the list of losses is *Cupressocyparis leylandii*, though one of its parents, *Chamaecyparis nootkatensis*, was cut back in every case, while the other, *Cupressus macrocarpa*, has so often been killed in other winters that the writer has ceased to grow it. *Cryptomeria* suffered some damage, but less than might be expected. The only extensive damage among broad-leaved trees was to Sycamore, of which many lost the top 2–3 ft. or more of their stems.

So far as frost damage is concerned, the wood in which the superiority of self-sown to planted trees is most evident is a ten-acre plantation of Oak formed in 1931–32. The planted trees, of Danish origin, show every year a percentage of dead leading shoots, the result of autumn

frosts, but the seedling Oaks that have sprung up between the lines do not suffer in this way.

[2695]. 42.21 : 12.25 (47.1) : 11.49.5 : 21.1 : 23.1 : 23.52 : 11.11.2. MULTAMÄKI, S. E. Kuusen taimien paleltuminen ja sen vaikutus ojitettujen soiden metsittymiseen. **[The freezing of Norway Spruce seedlings and its effect on the afforestation of the drained peatlands.]** *Acta forestalia fennica* 51 (1), (1942), 1946. pp. 353. [Fi.g.]

The literature on this subject is reviewed (there are 13 pp. of refs.) and an account is given of original work—chiefly in the Satakunta region of Finland—on the freezing of Spruce buds and shoots and its effects, natural Spruce regeneration and frost damage thereto on drained peatlands, and the temperature régime of the last-named.

Apart from death of the buds in very severe winters, frost damage to Spruce in Finland is chiefly to buds and shoots, which are killed by late frosts at the start of the growing season. Susceptibility varies with stage of development: buds just opening are the most susceptible; shoots just developed and of relatively low water content stand more severe frost than later, when their water content is higher. The critical temperature for shoot damage varies with stage of development from −2·8° to −4·3° C. Effects of frost damage on habit are considered in detail. The worst damage results from freezing of the leader and/or its terminal bud. Winter freezing of buds, which is not considerable in normal winters, appears to cause less damage than do late frosts.

In general, Spruce regenerates very well on suitable types of drained peatland, more abundantly and more certainly than on mineral soils, and is always accompanied on such sites by Birch, provided that seed of the latter is available. Moisture is a critical factor for Spruce seedlings and must exist in sufficient quantity in the surface humus.

The drained peatlands are by their nature and situation the sites of greatest frost hazard, where late frosts are more severe than on adjacent heathland. On open peatland Spruce seedlings suffer considerably from late frosts and require a shelterwood. Birch is eminently suitable for this purpose on account of its rapid growth, and young Spruce seedlings are apparently not weakened by the presence even of a very dense Birch overstorey. The shelterwood must, in fact, form a comparatively closed canopy to afford good protection against frost, and to maintain such a canopy, thinning should be restricted to the lower storey. Even a more open shelterwood, however, can modify air temperature near ground level by a few degrees, often sufficient to prevent damaging frost in a short night.

As conditions on drained peats are critical for Spruce, even very small variations in frost susceptibility may be important. In artificial regeneration only local seed should be used, and efforts might well be made to select a late-flushing race for these sites. [Cf. *For. Abstr.* 8 (No. 2691).]

[2696]. 42.21 : 12.25 (492). VLOTEN, H. VAN. Over de ziekteverschijnselen van den Corsicaanschen den, die van 1940 tot 1943 de aandacht trokken. **[On disease symptoms in Corsican Pine, 1940-43.]** *Nederl. Boschb.-Tijdschr.* 18 (12), 1946 (281–4). [Du.]

In 1940 a disease of Corsican Pine was observed in Holland, the symptoms being death of the bark, beginning on the stem between the root collar and (generally) the lowest whorls of branches, the dead portions showing a sinking-in and an efflux of resin. In an account by Voorbeytel Cannenburg [*Ned. Boschb.-Tijdschr.* 15 (5), 1942 (242–4)], who believed it to be caused by a then unidentified species of *Crumenula* [cf. *For. Abstr.* 8 (No. 2720)], this disease was regarded as a very serious menace.

The *Crumenula*, found on all diseased and dead trees, has since been identified as *C. pinicola*, which according to the literature is a saprophyte only. Further study has shown that trees surviving the period 1940–43 have made a striking recovery, and frost damage in the very severe winters of 1939–40 and 1940–41 is now regarded as in all probability the primary cause of the trouble. It is significant that in Holland the disease began among the lowest whorls of branches, and in dune plantations was more serious in depressions between the dunes than on the dune-tops.

A disease with similar symptoms in Belgium has been ascribed to *Dasyscypha calyciformis*, but is possibly the same, and due to the same cause, as that in Holland.

There seems to be no good reason for abandoning the planting of Corsican Pine in

Holland, as it was at first feared might be necessary.

42.3. *Precipitations*

[2697]. 42.3 (68.9). NORTHERN RHODESIA. **Department of Agriculture: annual report for the year 1945.** Govt. Printer, Lusaka. 1946. pp. 28.

On the Copperbelt, Ndunga (*Maesopsis eminii*) in six experimental plots between their fifth and seventh years died back nearly to ground level. One-year-old *Callitris calcarata* and four-year-old *Pinus patula* also suffered severely. All the trees died quite suddenly after the first few thunderstorms, following a specially dry season. This phenomenon of sudden death from shock as the rains break after a very dry season has been noted also in previous seasons, even in plantings of indigenous species.

[2698]. 42.31 : 12.26–8 : 21.2 : 11.62.3. GREEN, W. E. **Effect of water impoundment on tree mortality and growth.** *J. For.* 45 (2), 1947 (118–20). [U.S. Fish and Wildlife Service, Winona, Minn.]

Construction of a series of pools on the Upper Mississippi River during the 1930's provided the opportunity for this study of the effect of water impoundment on the mortality and growth of various trees and shrubs. On part of the affected area all trees and shrubs were cleared below a contour 2 ft. above normal pool level, and on part they were left standing. Details are given of the effect on a number of hardwood species. In general, bottomland trees survived remarkably well where the root crown was not permanently covered with impounded water. Mortality as an immediate effect of flooding was generally restricted to those trees, regardless of species, which were located where the water levels remained over the root crown. The depth of water over the root crown appears to be of little consequence, and trees standing in 4 ft. of water survived as well as those where the root crown was covered only a few inches. Thus, the major factor in tolerance to flooding appears to be the relationship of the root crown to normal water levels. Some trees above the 2 ft. contour have shown continued decrease in growth, following the stimulation of the first impoundment. More study will be given to this matter to determine how long trees in this situation will survive.

42.5. *Chemical Influences. Nutrient Deficiencies*

See also For. Abstr. 8 (Nos. 2265, 2774).

[2699]. 42.5 : 12.25 (942). ADAMS, A. J. S. **Zinc in the south eastern forests of South Australia.** *Aust. Timb. J.* 12 (8), 1946 (461, 463).

Rosetting and die-back on *Pinus radiata* in the south-east of South Australia are disorders that occur in early youth. Rosetting usually appears at 1–3 years, and die-back at 3–8 years old. Both disorders disappear at the formation of canopy, but they tend to postpone canopy formation, thus allowing more time for die-back to occur. The total effect is, that in a bad die-back area there may be no sound stems at all. By 1939 the following facts had been established. The trouble is confined to certain soil types. Natural regeneration established without burning is little subject to attack. Heavy pruning of side limbs prevents the leaders from dying. Die-back trees produce little seed. The loss of surface soil as a consequence of very heavy fire or wind erosion increases the incidence of these diseases. A treatment applied in 1940 to several hundred areas of rosetted and incipient die-back Pines has been very successful; moribund trees put on healthy foliage and produced large buds within a year, and now, 6 years later, they are large vigorous trees and have formed canopy. Untreated controls show a very poor growth. Treatment is in the spring, $2\frac{1}{2}$ years after planting, and consists in drenching the foliage of all trees with $2\frac{1}{2}$-per-cent. zinc-sulphate solution distributed through a knapsack sprayer, needing 5–6 lb. of zinc sulphate per acre. One treatment is sufficient. At present about 1,000 acres per annum are being treated.

43. FOREST FIRES

43.0. *Predisposing Factors and Causes*

[2700]. 43.0 : 32.29.2. MORRIS, W. G. **Some observations on slash burning west of the Cascades.** *For. Res. Note Pacif. Nthwest. For. Exp. Sta.* No. 33, 1945 (10–11).

Detailed measurements and observations on slash-burning fires in the autumn of 1944. Too high a wind velocity proved to be the greatest unpredictable danger on these fires.

43.1. *Protective Measures*

[2701]. 43.1 (68.9) : 81. NORTHERN RHODESIA. **Department of Agriculture: annual report for the year 1945.** Govt. Printer, Lusaka. 1946. pp. 28.

The fire protection of 165 sq. miles of unexploited forest was entrusted to native forest indunas. These are generally local headmen who recruit their own labour force to early-burn the savanna and grassland surrounding the unexploited Teak forests before the latter are dry enough to be readily inflammable. The expenses of these gangs and a variable amount of supervision are provided by the department. The forest indunas serve as fire-watchers in their own areas throughout the rest of the dry season and muster local inhabitants in the event of an outbreak of fire. The system is complete in itself for unexploited forest, and is especially useful in that the people living near forests are made aware of the importance of fire protection and the need for care during the dry season (p. 17).

2702]. 43.1 : 07.7. FUNK, I. C., and KNUDSEN, C. S. **High lights from results of helicopter tests.** *Fire Control Notes* 8 (1), 1947 (10–16).

An account of tests made in California on the performance of Sikorsky helicopters in mountainous regions. Data on specifications, performance, maximum gross weight and net payload for spot landing and take-off at various density altitudes, rate of climb of helicopter with lift blades, and maximum permissible height above landing spot of obstacles in take-off and landing approach paths, are given in a series of tables.

[2703]. 43.11 : 43.02. BICKFORD, C. A., and NEWCOMB, L. S. **Prescribed burning in the Florida flat woods.** *Fire Control Notes* 8 (1), 1947 (17–23). [Northeastern Forest Exp. Sta.]

This paper describes methods of prescribed burning developed and used on the Osceola National Forest in north-east Florida in the Longleaf/Slash Pine type. Fire protection in this type results in the extension of the more valuable Slash Pine, but it also leads to the accumulation of inflammable material and increased fire hazard. Slash Pine about 6 ft. in height and Longleaf Pine over one year old can stand slow-burning prescribed fire in the dormant season. The necessary measures of analysis, planning, preparation and burning are described. The importance of thorough planning and preparation, training of crews, and obtaining reliable weather forecasts is stressed. [Cf. *For. Abstr.* 8 (Nos. 2374, 2377–9, 2382).]

[2704]. 43.12. HAND, R. L., and HARRIS, H. K. **Preliminary report on aerial detection study.** *Fire Control Notes* 8 (1), 1947 (28–32).

Report on a study to determine the most economical combination of ground and air detection, based on percentage of coverage and frequency of observation.

[2705]. 43.12 : 07.7. HAINES, A. L. **The profiling slide rule and its use.** *Fire Control Notes* 7 (3), 1946 (8–12).

The potential value of a slide rule in checking the intersection of a line of sight with distant topography in making visible-area maps was first expounded in 1932. Techniques were developed and perfected to put the slide rule to work in field sketching of visible areas, by the California fire research group in 1932–35. In recent years the technique has been neglected. The author brings the method to attention again and shows how it may be adapted to regular lookout use by means of a specially constructed slide rule which is described in detail. The technique is necessarily limited to areas for which reasonably accurate topographic maps are available.

[2706]. 43.13 : 07.7. WERTZ, H., and MAY, C. V. **A new mobile flame thrower.** *Fire Control Notes* 7 (3), 1946 (36–8). [Los Angeles County Department of Forester & Fire Warden.]

The writers have designed a combination butane-Diesel flame thrower which gives promise of being a valuable addition to fire control equipment. The unit consists of a petrol-driven compressor and 70-gallon tank of Diesel oil, a battery of six 10-lb. butane tanks connected to a manifold, 75 ft. of $\frac{3}{8}$-inch oil-resistant hose, and a specially built butane-Diesel flame-throwing gun, constructed with the nozzle so far from the heat of the flame that no shield is required for the operator. The whole is mounted in a 2-wheeled trailer. For backfiring in light cover, the butane alone is

needed; it can throw a flame for a maximum distance of 4 ft. In heavier materials, such as trees and dense green cover, the combination butane and Diesel oil is used. The operator can throw a mass of flaming fuel over a distance to 50 ft., leaving enough of the slower burning Diesel oil to ensure thorough ignition. In the heavier type of cover, more than 300 yds. of fire line has been burned in 19 minutes, using 20 gallons of Diesel oil. A smaller portable unit on the same principle is now being manufactured.

[2707]. 43.13 : 07.7. WHITE, H. M. **Jeep tanker.** *Fire Control Notes* 8 (1), 1947 (26–7).

Description of a transformed jeep, with a 60-gallon water tank fitted behind the seats, and a pump, hose and other equipment.

[2708]. 43.13 : 07.7. **The Louisiana fire jeep.** *Fire Control Notes* 7 (3), 1946 (33–5).

Description of the transformation of standard army jeeps for use in fire detection and reconnaissance. They are fitted with 2-way radio and a 55-gallon water tank, and can if necessary tow a 200-gallon tank. These jeeps can reach a fire at an early stage, reconnoitre the area, and attack the blaze before the heavier equipment can arrive.

43.3. *Fire Damage*

See also *For. Abstr.* 8 (No. 2463).

[2709]. 45.3 (74.9). LITTLE, S. **The effects of forest fires on the stand history of New Jersey's Pine region.** *For. Mgmt. Pap. Ntheast. For. Exp. Sta.* No. 2, 1946. pp. 43.

Some account is given of forest fire damage in the area during the past 200 years. Nearly all the serious damage was caused by the hot heads of large fires and damage decreases greatly with lessened fire intensity. Where fire intensity is not sufficient to kill all the stand, damage varies inversely with tree size. Pines suffer far less mortality than Oaks of the same size. There is a considerable amount of delayed mortality in classes where trees are severely injured but still living a few weeks after the fire, and it is recommended that damage appraisals should not be made until one year after the fire, by which time most of the delayed mortality will have occurred. Size of trees and intensity of fire greatly influence the extent to which surviving Pines develop deformed crowns, and the extent to which both Pines and Oaks form fire scars at the base of the stems. The smaller the surviving tree, the greater is the probability of such damage, and the hotter the fire, the larger are the trees that are injured. While the elimination of large fires is essential for the production of commercial stands in the Pine Region, light winter fires may be decidedly beneficial under certain conditions, on all sites except the White Cedar/hardwood areas.

44. DAMAGE BY HARMFUL PLANTS. VIRUS DISEASES

44.1. *Forest Weeds*

Cf. *For. Abstr.* 8 (Nos. 2379, 2382, 2413–6, 2719).

[2710]. 44.1 (729.8). BERMUDA. **Report of the Plant Pathologist for the year 1945.** Department of Agriculture, Bermuda. 1946. pp. 12.

The ammonium salt of 2,4-dichlorophenol-acetic acid, 10 per cent. (2,4-D), sprayed at the rate of 1 lb. in 12 gal. of water, successfully controls a variety of weeds including *Ipomoea villosa* and *Ricinus communis* in Bermuda (p. 4).

[2711]. 44.1 : 24.31. GRIGSBY, B. H. **Some effects of 2,4-D on ragweed and certain woody plants.** *Quart. Bull. Mich. agric. Exp. Sta.* 28 (4), 1946 (304–10).

Ragweed can be killed by a single application of 2,4-D at a concentration of 1,000 p.p.m. Pollen production by old plants can be stopped, without causing the immediate death of the plants, by spraying with a concentration of 500 p.p.m. A more rapid response can be obtained by the addition of very small amounts of sodium chlorate or ammate. Pollen formation can be prevented by spraying ragweed in the stage of growth just preceding flower-stalk elongation with 250 p.p.m. 2,4-D. Plants sprayed in this stage appear to be arrested in development and usually persist until frost; they produce few seeds.

The young growth of poison ivy is usually killed by 100 p.p.m. of 2,4-D, but older growth may be somewhat more resistant. Eradication of poison ivy by this method has not been demonstrated. 2,4-D seems to have

little effect upon mature growth of many woody plants such as Dogwood, Raspberry, Alder, Honeysuckle, and Meadowsweet. *Author's summary.*

44.2. *Parasitic Higher Plants*

[2712]. 44.2 : 12.25 : 12.26–8 : 44.3 : 12.21. Ellis, D. E. **Anthracnose of dwarf mistletoe caused by a new species of *Septogloeum*.** *J. Elisha Mitchell sci. Soc.* 62 (1), 1946 (25–50 + 3 plates). [Dept. of Botany (Plant Pathology Division), State College, Raleigh, N.C.] L.S.

An account of the host genus (all parasites of conifers); the disease; its causal fungus (*S. gillii* n. sp.); cultural characteristics, temperature relations and dissemination of the latter; successful inoculations; and the effect of the fungus on its host. The species attacked (*Arceuthobium campylopodum* and *douglasii*) are important pests of conifers, and as in some localities the disease appears greatly to reduce the reproduction and local spread of the mistletoe, its possible use in biological control over certain restricted areas is suggested.

44.3. *Fungi*

[2713]. 44.3. Great Britain. **Annual report (thirty-third year), 1945: East Malling Research Station, near Maidstone, Kent, 1st January 1945 to 31st December, 1945.** Kent Incorporated Society for Promoting Experiments in Horticulture. 1946. pp. 148 + plates.

In an attempt to throw light on the mechanism of the fungicidal action of thiuram disulphides, the decomposition of these substances *in vitro* has been investigated. The dialkyl and tetra-alkyl derivatives behave quite differently on heating. In the latter group the type of solvent in which the substance is heated determines the course and end products of decomposition. Preliminary attempts have been made to correlate fungicidal activity with the facility of the liberation of amine and carbon disulphide under standardized conditions. The products of the atmospheric decomposition of thin films of thiuram disulphides and dithiocarbamates have been examined. A series of di-*n*-alkyl-dithiocarbamates has been synthesized for the purpose of studying the influence of constitution upon toxicity (p. 39).

[2714]. 44.3 : 11.1. Foister, C. E. **The relation of weather to fungus diseases of plants.** *Bot. Rev.* 12 (9), 1946 (548–91).

This supplement to an article in *Bot. Rev.* 1, 1935 (497–516), presents a general survey of the effects of weather on the production, survival, spread and germination of spores and other structures of fungi, and on the initiation and progress of the epidemics they cause, with particular reference to diseases of agricultural and horticultural crops.

A summary is given of recent literature on the survival of fungi in relation to temperature, moisture content of soil and air, spore structure, host stimulation and cultural processes; on the height, distance, mechanics and mathematics of dispersal; on germination in relation to water, temperature, microclimate and nutrition; on soil conditions in relation to plant diseases, and on methods for forecasting the occurrence of blight.

[2715]. 44.3 : 12.11.2 : 11.17. Gregory, P. H. **The dispersion of air-borne spores.** *Trans. Brit. mycol. Soc.* 28 (1/2), 1945 (26–72). [Rothamsted Exp. Sta., Harpenden, Herts.] I.M.I.

The deposition of air plankton, such as passively air-borne pollen grains or fungus spores, decreases with increasing distance from a source. The factors controlling the scattering of air plankton are reviewed, and observed gradients of deposition are discussed with special reference to fungi causing diseases of plants.

[2716]. 44.3 : 12.25–9 : 12.21 (729.8). Bermuda. **Report of the Plant Pathologist for the year 1945.** Department of Agriculture, Bermuda. 1946. pp. 12.

The report includes a list of 200 species of fungi with their hosts in Bermuda (pp. 9–12).

[2717]. 44.3 : 12.25 : 12.21 (73). Stillinger, C. R. **Notes on *Cronartium occidentale*.** *Nthwest Sci.* 18 (1), 1944 (11–16). [U.S. Bureau of Entomology and Plant Quarantine.] A.P.B.

Includes some first reports on new locations and new hosts of the Piñon blister rust (*Cronartium occidentale*). The geographical range of this rust reaches far beyond any known locations of Piñon Pines (recorded distances of up

to 425 miles). It is suggested that the aeciospores of the caulicolous rusts may spread as far as 650 miles before infecting the alternate host. Although overwintering of Piñon blister rust appears to be very infrequent over the range of the rust as a whole, the phenomenon is comparatively common in southern California.

The stages of the Piñon blister rust on *Ribes* are very similar in appearance to those of the introduced White Pine blister rust (*Cronartium ribicola*) on the same host, and in the White Pine forests of western Montana, Idaho, Washington, British Columbia, Oregon and northern California there are areas in which the two rusts may be found together.

[2718]. 44.3 : 12.25 : 12.21. KIMMEY, J. W. **Notes on visual differentiation of White Pine blister rust from Pinyon rust in the telial stage.** *Plant Dis. Reptr.* 30 (2), 1946 (59–61). [U.S. Bureau of Plant Industry.] I.M.I.

Five visual differences that may occur between *Cronartium ribicola* and *C. occidentale* are described briefly. A specimen with considerable diseased area of leaf not bearing telial columns is likely to be infected with *C. ribicola*.

[2719]. 44.3 : 12.25 : 12.21 (79) : 44.1 : 12.26–8. CRAIG, G. A. **Chemical war waged on blister rust.** *Timberman* 47 (12), 1946 (39, 74, 76, 78).

During 1944–45, laboratory and greenhouse tests and small-scale field plots in California showed that the new herbicide 2,4-dichlorophenoxyacetic acid (2,4-D) was fully effective on certain species of *Ribes*. *R. roezli* proved to be one of the most susceptible species. Extensive tests now being conducted by the Bureau of Entomology and Plant Quarantine in the Stanislaus National Forest indicate that, by the use of spray equipment, heavy concentrations of *R. roezli* (the commonest of the alternate hosts of *Cronartium ribicola* in the Sierra Nevada) can be eradicated in less than a quarter of the time and at about one-third of the cost of hand-grubbing methods. The equipment used for spraying is a 200-gallon tank mounted on a 4 × 4 Chevrolet truck, a Bean pump run by a 2½-h.p. petrol engine, and ¼-, ⅜-, and ½-in. hose for main line and laterals. Two men each handle an orchard-type nozzle, which delivers the spray at about 250 lb. pressure, and operators have sprayed as far as 1,400 ft. from the truck. It takes about 2 hours to pump out the 200 gallons, go to a filling spot in a stream for another load, and return to the spray area. A foreman drives the truck, helps lay out the hose, operates the pump, and directs the work. The 2,4-D is mixed with water at rates varying from 90 to 1,440 parts of chemical per million parts of water for further study of dosage and concentration. The general dosage in use is 720 parts of chemical per million parts of water, but it may prove possible to reduce this and still get a satisfactory kill. Other chemicals are added, to cause the solution to adhere to the bushes and to colour them so that recently sprayed plants can be distinguished from those not yet sprayed.

[2720]. 44.3 : 12.25 : 12.21. ETTLINGER, L. Über die Gattung *Crumenula* sensu Rehm mit besonderer Berücksichtigung des *Crumenula*-Triebsterbens der *Pinus*-Arten. **[The genus *Crumenula* sensu Rehm, with particular reference to the *Crumenula* die-back of *Pinus* spp.]** Kommissionsverlag Buchdruckerei Büchler & Co., Bern. 1945. pp. 73+[2]+4 plates. [G.] P.R.

A doctoral thesis. Part I deals with *Crumenula abietina* (*Brunchorstia pinea*), (*a*) reviewing the literature on this species and the die-back of *Pinus* spp. for which it is responsible; (*b*) recording for the first time its occurrence in Switzerland on *Pinus* spp. in alpine plantations, and describing studies on its morphology and physiology. The Swiss fungus shows some differences, but no more than those of a race with no clear morphological distinctions, from Danish material. The description of the spores of the *B. pinea* stage, however, is emended. In pure culture the Swiss fungus had a much higher growth rate over a rather wider temperature range than had the Danish. For both, the optimum was 18·9° C. Growth ceased at 21·5° in the Danish but continued in the Swiss race at 24·9°, and both were apparently killed at 27·9°. The temperature range explains the northern and alpine distribution of the fungus, which presumably would not tolerate regions with a hot summer. Its parasitic activity is held to be mainly during the dormancy of the trees, in the cold season. At rates of growth comparable to those in culture a longish period would be necessary for proliferation throughout the current year's shoot, but winter temperatures under the protection of a snow layer may

well suffice, as growth in culture at 0° was still about one-quarter of that at the optimum temperature.

Part II deals with the remainder of the genus. *C. pinicola* (the type species), *C. sororia* and *C. abietina* are maintained as distinct species and differences between the three are discussed in detail, followed by a full description of *C. laricina* n. sp., the agent of a die-back and needle-cast of Larch in Swiss alpine plantations, and of its behaviour in culture. As inoculations have so far given negative results, the parasitism of the last-named is not finally proved, but is probable on other evidence. In a final section on the nomenclature and systematic status of the genus, *Crumenula* is proposed as a *nomen conservandum*.

An appendix is devoted to *Brunchorstia gibbosa*, the *Crumenula* stage of which is unknown, and its differences from *B. pinea* are noted. *B. gibbosa* appears to be a pure saprophyte.

There are 5 pages of references.

[2721]. 44.3 : 12.25 : 12.21. HEPTING, G. H., and ROTH, E. R. **Pitch canker, a new disease of some Southern Pines.** *J. For.* 44 (10), 1946 (742–4).

A hitherto unreported canker of potential importance on some of the Southern Pines (*Pinus virginiana*, *P. echinata*, *P. rigida*) is described. Its outstanding features are a copious production of pitch, lack of fungus fruiting bodies, and the speed with which it kills branches, leaders, and sometimes main stems. Inoculations made with a *Fusarium* consistently isolated from natural cankers, produced the disease in every case where a slight injury to the bark accompanied the inoculation, and in some cases where no injury was made. Inoculations with *Caliciopsis pinea* produced a different and less lethal type of canker, and inoculations with some other fungi isolated from Pine during the course of this work failed to produce cankers. The causal *Fusarium* is probably an undescribed species belonging to the section *Liseola*. *From authors' summary.*

[2722]. 44.3 : 12.25 : 12.21 (46). MARTÍNEZ, J. B. Las micoses del *Pinus insignis* en Guipúzcoa. **[Fungus diseases of *Pinus insignis* [*P. radiata*] in Guipúzcoa.]** [*Trab.*] *Inst. for. Invest. Exp. Madrid* 13 (23), 1942. pp. 72 + plates. [Span.f.e.g.] P.R.

Pinus radiata has been successfully acclimatized in the north of Spain, but in some areas it suffers severely from fungus diseases. The fungi responsible for defoliation (in order of importance) were *Naemacyclus niveus*, *Septoria acicola*, *Diplodia acicola*, and *Lophodermium pinastri*, while the chief wood-destroying species were *Dacryomyces palmatus* and *Irpex fusco-violaceus*. Notes are included on control and preventive measures in the nursery and the forest. It is possible to reduce the spread of diseases by planting *Pinus radiata* in strips separated by belts of *Cupressus macrocarpa*.

[2723]. 44.3 : 12.25 : 12.21 (493). La rouille 'suisse' des aiguilles du sapin de Douglas. **[The 'Swiss' leaf cast of Douglas Fir.]** *Bull. Soc. for. Belg.* 52 (7/8), 1945 (60–8 + plate). [F.]

Phaeocryptopus gaeumanni was discovered on needles of *Pseudotsuga taxifolia* in the arboretum of St. Michel in Belgium in 1943. This note gives a brief account of the morphology and taxonomy of the fungus, the symptoms and consequences of the disease, and its distribution and origin. *From author's summary.*

[2724]. 44.3 : 12.25 : 12.21 (71.1) : 31.8. BUCKLAND, D. C. **Investigations of decay in Western Red Cedar in British Columbia.** *Canad. J. Res.* 24 C (5), 1946 (158–81). P.R.

The major heart-rotting fungi of living Western Red Cedar [*Thuja plicata*] on the coast, in decreasing order of importance, are *Poria asiatica* (brown cubical pocket and butt rot), *Poria albipellucida* (white ring rot), *Fomes pini* (white pitted trunk rot), *Merulius* sp. (brown crumbly butt rot), and *Poria subacida* (spongy white rot). In the interior of the province they are *Poria asiatica*, *P. weirii* (yellow ring rot), *Fomes pini*, *Polyporus balsameus* (brown cubical butt rot), *Merulius* sp. and *Poria subacida*. Other fungi attacking the heartwood of living trees less extensively are *Fomes annosus*, *F. nigrolimitatus*, *F. pinicola*, *Armillaria mellea*, *Omphalia campanella*, *Polyporus schweinitzii*, and *Coniophora cerebella*.

On the areas investigated, loss through decay in stands 50 to 450 years of age never exceeded increment. It was indicated that decay in younger stands was of importance. Loss through decay and incidence of infection were

appreciably higher in the interior than on the coast. No reliable external indications of decay in the standing tree were found.

Deterioration in felled trees was caused by *Poria weirii*, *P. albipellucida*, *P. subacida*, *Armillaria mellea*, *Omphalia campanella*, *Fomes annosus*, *F. nigrolimitatus*, and *F. pinicola*. *Polyporus cuneatus* and *Hymenochaete tabacina* were the major decay organisms of Cedar sapwood and slash. *Polyporus abietinus*, *P. versicolor*, *P. semipileatus*, *P. hirsutus* and *Poria isabellina* were restricted in distribution or of irregular occurrence.

To assist in the identification of cultures, all the major heart-rotting organisms were grown on tannic and gallic acid media. Seventy-seven species of Basidiomycetes were collected on living and dead *Thuja plicata* in British Columbia from 1943 to 1945.

[2725]. 44.3 : 12.25 : 12.21 (79.5 : 79.7). RHOADS, A. S., and WRIGHT, E. ***Fomes annosus* commonly a wound pathogen rather than a root parasite of Western Hemlock in Western Oregon and Washington.** *J. For.* 44 (12), 1946 (1091–2). [U.S. Bureau of Plant Industry.]

A study has been made recently of the incidence and extent of decay developing from logging and related injuries to residual trees of Western Hemlock (*Tsuga heterophylla*) and Sitka Spruce (*Picea sitchensis*) following partial cutting in western Oregon and Washington. Among the outstanding features of this study was the prevalence of trunk rot (mostly basal) in Western Hemlock, due to *Fomes annosus* acting as a wound pathogen, and the failure to find this fungus entering through roots except where they were injured above the ground. In a study of 600 scars, 36 sunscald lesions, and 37 broken tops on 198 Western Hemlocks, rot due to *F. annosus* was found in connexion with 119 of the 296 scars showing decay, and also in 5 sunscald lesions and 3 broken tops. It was isolated from 95 rot infections associated with scars, and also from 4 sunscald lesions and 3 broken tops, a total of 170 isolations being secured. *F. annosus* was found to exceed in frequency of occurrence any other fungus gaining entry through injuries, and the volume of decay due to it exceeded that of all other fungi combined. [Cf. *For. Abstr.* 4 (247); 6 (114).]

[2726]. 44.3 : 12.26–8 : 12.21 (73) : 34.24. WINTERS, S. R. **A blight despoils 33,000,000 acres.** *Sth. Lumberm.* 173 (2177), 1946 (138–40).

The Chestnut blight disease (*Endothia parasitica*), introduced into the United States about 40 years ago, has killed practically all Chestnut throughout its range of growth. The U.S. Forest Service estimated last year that there are 22 million long cords of standing dead Chestnut in the mountainous areas of North Carolina, Tennessee, Kentucky, West Virginia and North Georgia. About 14 million cords in this region are reasonably near to tannin-acid extract plants now in operation. Some account is given of the salvage operations and of the process of acid extraction. A by-product of the acid-extracting process is a heavy paper used in the manufacture of corrugated boards.

[2727]. 44.3 : 12.26–8 : 12.21. Aantasting van populieren door *Dot[h]ichiza populea*. **[Attack on Poplars by *Dothichiza populea*.]** *Nederl. Boschb.-Tijdschr.* 18 (12), 1946 (289–90). [Du.]

In various parts of Holland large numbers of young Poplars died in 1946 from attacks by this fungus. In some nurseries up to 80 per cent. of the Poplar stock was affected, and in many places stock planted out in the previous winter for reforestation has all been killed. The severity of the attacks is thought to be connected with an increase of sources of infection in the form of stumps and branches of Poplars felled during the war or damaged by shelling, etc. Resistance of the young stock must also have been weakened by a dry spring. Previous experience has shown condition of the host, and particularly disturbances in water supply such as occur in transplanting, to be the critical factor in the course of the disease. It is therefore recommended that the period between lifting and planting out should be reduced to a minimum; the stock should preferably be lifted in spring and planted out immediately. Any cuts should be covered with a commercial wound dressing, red or white lead, or grafting wax. Only healthy cuttings, treated before delivery with 1½-per-cent. Bordeaux paste, should be used. Once planted out, the young trees should not be pruned for the first 4 years, thus avoiding much of the risk of infection during a period when the resistance of the plants is reduced.

[2728]. 44.3 : 12.26–8 : 12.21 : 12.11.3. MARTÍNEZ, J. BENITO. El estado actual del problema de la grafiosis del olmo. **[The present position of the Dutch Elm disease problem.]** *Montes, Madrid* 1 (2), 1945 (48–56). [Span.] I.M.I.

Includes a review of the principal investigations on Dutch Elm disease in recent years, with indications of results obtained with European, Asiatic and American Elms. The most promising method of control in Spain, as elsewhere, is by breeding disease-resistant hybrids. In addition to the more extensive use of the Buisman Elm, the author recommends experiments in the acclimatization of *Ulmus pumila* in Spain and crosses between *U. pumila*, the Buisman Elm, and selected indigenous trees.

44.4. *Virus Diseases*

[2729]. 44.4 : 12.26–8 (73). **Distribution of Elm phloem necrosis.** *Amer. Nurserym.* 84 (12), 1946 (28–9).

A brief account of the distribution of the disease in the United States.

45. DAMAGE BY ANIMALS

45.1. *Mammals*

See also *For. Abstr.* 8 (No. 2392).

[2730]. 45.11 (66.7). GOLD COAST. **Report on the Forestry Department for the year 1945-46.** Govt. Printing Department, Accra. 1946. pp. 8.

Trials with a Wolseley Electric Fence apparatus for protection against stock have given promising results, with a three-strand fence consisting of one live wire and 2 earthed wires; a single live wire proved ineffective, as the ground is normally too dry to give sufficient shock (p. 4).

[2731]. 45.12 : 12.25 : 13.2. LITTLEFIELD, E. W., SCHOOMAKER, W. J., and COOK, D. B. **Field mouse damage to coniferous plantations.** *J. For.* 44 (10), 1946 (745–9).

During the winter of 1938–39, coniferous plantations in Montgomery County, New York State, were severely damaged by a high population of field mice (*Microtus pennsylvanicus*). Scots Pine and Douglas Fir were most heavily attacked. Norway Spruce, White, Red and Jack Pine, White Cedar, Balsam Fir and the Larches were only slightly attacked, and White Spruce not at all. The mice gnawed off the bark and phloem tissue from the roots, the basal portion of the trunk, and the lower branches. Considerable areas of wood were exposed, and often the tree was girdled and ultimately died. A second attack, which coincided with the next periodic field mouse peak, occurred 4 years later. This did even more damage than the first, especially to Scots Pine, causing the death of many trees and large openings in the plantation. It is doubtful whether these plantations will ever develop into normally stocked stands. Scots Pine, which has been used extensively for the reforestation of abandoned farm land in the North-eastern United States, appears to be a favourite food plant for a number of wild animals and birds: the red squirrel, the Pine grosbeak [cf. *For. Abstr.* 7 (No. 955)], the porcupine, and the white-tailed deer.

45.3. *Insects*

See also *For. Abstr.* 8 (Nos. 2250, 2779).

[2732]. 45.3 (74.6) : 11.11.2. CONNECTICUT. **Connecticut State Entomologist: forty-third report, 1943.** *Bull. Conn. agric. Exp. Sta.* No. 481, 1944. pp. 324.

Many Connecticut forest insects were affected by the extremely low temperatures of the winter of 1942–43. The larvae of *Scolytus multistriatus* were noticeably affected by the cold, and a mortality of up to 80 per cent. occurred above the snowline in Litchfield and Newhaven counties except in the shore region. The effect of cold becomes operative when the temperature reaches $-5°$ to $-10°$ F. The infestation was very light in 1943 in Elm limbs broken by the ice storm of the preceding winter. Infestations of *Rhyacionia buoliana* have declined significantly because of cold winters. Samples of infested Red Pine twigs from a number of plantations showed complete larval mortality. The larvae of this species die at $-19°$ F. A majority of the egg masses of *Lymantria dispar* exposed above the snow line produced no larvae in the spring (pp. 240–1).

[2733]. 45.3 : 07.7. **Report of the Chief of the Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, 1945.** U.S. Govt. Printing Office. 1946. pp. 63.

Tests have been made with several commercial models of power atomizers for the application of insecticides in the form of a mist. With a mist blower the tallest shade trees can be effectively covered and the spray can be blown laterally for distances up to 300 ft. Much less spray material is used by this method than by the conventional application of dilute sprays with power sprayers. For example, 275 shade and orchard trees have been treated effectively for the control of defoliators with 12 gal. of concentrated DDT spray, whereas several hundred gallons of dilute spray applied with a power sprayer would have been required to treat that number of trees. The mist blower is especially well adapted for treatment of shade and roadside trees and orchards. When used in conjunction with apparatus for generating aerosols by heat, these blowers increased materially the depth of effective penetration of the DDT-bearing smokes into forested areas (p. 6).

[2734]. 45.3 : 07.7. REIER, J. Die Entwicklung der Flugzeugbekämpfung in technischer Hinsicht. [**The development of aerial control of pests from a technical point of view.**] *Monogr. Z. angew. Ent.* No. 15, 1942 (605–30). [G.] I.I.E.

Deals with the history of forest dusting outside Germany, the development of a German dusting apparatus, the technical requirements of aeroplane dusting, directions for the construction of satisfactory dusting equipment, and flying qualities of aeroplanes used for dusting forests.

[2735]. 45.3 : 07.7. WELLENSTEIN, G. Zur Frage der Kennzeichnung von Flugfeldern bei der Forstbestäubung. [**On the question of marking flight zones in forest dusting.**] *Monogr. Z. angew. Ent.* No. 15, 1942 (631–44). [G.] I.I.E.

Balloons have several advantages over smoke pillars and flags in marking out areas of the forest where aeroplane dusting is required. The present paper deals with the development of suitable types of marker balloons and with the solution of technical difficulties in their use.

[2736]. 45.3 : 12.25–8 (43.9) : 13.15 : 13.2. GYÖRFI, J. Beiträge zur Kenntnis der Wirte von Schlupfwespen. [**Contributions to the knowledge of the hosts of parasitic Hymenoptera.**] *Z. angew. Ent.* 30, 1944 (79–103). [G.] [Institut für Forstschutz der Kön.-Ung. Palatin-Josef-Univ. für technische und Wirtschaftswissenschaften.]

Records of parasites of Hungarian forest insects with food plants of the hosts.

[2737]. 45.3 : 12.25–8 : 13.2 (71). MCGUFFIN, W. C. **New descriptions of larvae of forest insects: *Nyctobia, Eufidonia* (Lepidoptera, Geometridae).** *Canad. Ent.* 77 (11), 1945 (197–9). O.R.S.

[2738]. 45.3 : 12.25 : 13.2 (410). **The black Pine beetle (*Hylastes ater*) and other closely allied beetles.** *Leafl. For. Comm., Lond.* No. 4 (revised), 1946. pp. 9.

Notes on the breeding habits of 5 *Hylastes* and 1 *Hylurgops* species in Britain, the nature of the damage caused by the beetles, with preventive and control measures. Where a coniferous crop has been felled, replanting with conifers should be delayed for 2–3 years until breeding in the stumps has stopped.

[2739]. 45.3 : 12.25 : 13.2 (71). HOPPING, G. R. **Control of the more injurious bark beetles of the Canadian Rocky Mountain region.** *Procd. Publ. Div. Ent. Dep. Agric. Can.* No. 49, 1946. pp. 7 + fig. P.R.

The Mountain Pine bark beetle (*Dendroctonus monticolae*), the Western Spruce bark beetle (*Dendroctonus borealis*) and the Balsam bark beetle (*Dryocoetes confusus*) are the most destructive species in Western Canada. If control measures are necessary, strips should first be cruised through the area in order to estimate the number of trees attacked and the size of the crews and costs necessary. A 100-per-cent. cruise should then be made with the object of cutting and burning all infested trees. Procedure and equipment are described. If there is an average of 5 or more green infested trees per acre, control measures will not succeed and salvage operations should be undertaken.

[2740]. 45.3 : 12.25 : 13.2 (410). ***Adelges* attacking Spruce and other conifers.** *Leafl. For. Comm., Lond.* No. 7 (revised), 1946. pp. 5.

Spraying as a preventive of or remedy for *Adelges* attack in established plantations has so far been considered too expensive for use in Great Britain. In Denmark, however, spraying is regularly practised in plantations of all ages. 3- to 5-per-cent. Lysol is used in early spring

just as the buds are opening, and at intervals throughout the summer whenever inspection reveals the presence of *Adelges*. The cost 'does not appear to be excessive if carried out in the early stages of infestation'.

Instructions are given for preparing emulsions of paraffin or of nicotine for spraying nursery stock or ornamental trees. The dipping of young plants in autumn or spring in a solution of 1 lb. soft soap to 1 gal. of water, will free them from the wintering forms of *Adelges*, and is recommended for suspected plants before despatch to the planting areas.

[2741.] 45.3 : 12.25 : 13.2 (43.1–5) : 13.15. WELLENSTEIN, G. [Editor]. Die Nonne in Ostpreussen (1933–37). Freilandstudien der Waldstation für Schädlingsbekämpfung in Jagdhaus Rominten. **[The nun-moth in East Prussia (1933-37). Field studies at the Pest Control Station at Rominten.]** *Monogr. Z. angew. Ent.* No. 15, 1942. pp. xvi + 682 + plates. [G.] I.I.E.

See following abstracts.

[2742]. 45.3 : 12.25 : 13.2 (43.1–5). WELLENSTEIN, G. Die Bearbeitung der ostpreussischen Nonnenvermehrung (1933–37) durch die Waldstation für Schädlingsbekämpfung in Jagdhaus Rominten. **[The work on the East Prussian nun-moth epidemic (1933-37) carried out at the Pest Control Station at Rominten.]** *Monogr. Z. angew. Ent.* No. 15, 1942 (1–16). [G.] I.I.E.

In 1934 stations were set up at Rominten and Schwalgendorf to study the biology of the nun-moth and its parasites, and the ecology of the bird life of the forest and its relation to epidemic increase. Results are given in separate papers. The pest control section devised and applied various control measures.

In the winter of 1934–35 the chemical factories succeeded in developing the first nun-moth contact poisons containing dinitro-o-cresol compounds which proved extremely effective in destroying the larvae. Motor dusters proved to be inadequate in the Rominten Spruce stands and in 1936 the aeroplane was used exclusively in the application of insecticidal dusts. Different types of aircraft were compared for their suitability for the purpose, and the effect of stomach and contact poisons on insects, higher animals and plants was investigated.

[2743]. 45.3 : 12.25 : 13.2 (43.1–5) : 13.15. MORS, H. Die Entwicklung der Nonne im Freiland unter besonderer Berücksichtigung des Klimas und der Frasspflanze. **[Development of the nun-moth in the field with special reference to climate and food plants.]** *Monogr. Z. angew. Ent.* No. 15, 1942 (42–93). [G.g.] I.I.E.

Temperature was shown to have a decisive effect on the rate of development of the insect. In young and dense stands the larvae emerged later than in older stands and open parts of the forest.

A few days after the emergence of the larvae the Spruce began to put forth shoots. In flowering years when the leaf-buds opened relatively late, the flowers formed a substitute food for the larvae. Data are recorded on the duration of stages in the life-cycle in 1934–37.

[2744]. 45.3 : 12.25 : 13.2 (43.1–5). MITSCHERLICH, H., and WELLENSTEIN, G. Die Nonne an Früh- und Spättreiberformen der Fichte. **[The nun-moth on early- and late-flushing forms of Spruce.]** *Monogr. Z. angew. Ent.* No. 15, 1942 (94–125). [G.g.] I.I.E.

In nun-moth epidemics individual trees have always been observed to remain green in the midst of severely attacked stands. The most obvious correlation is that between early shoot development and the degree of damage by the nun-moth. In several consecutive years the early-flushing Spruces were the most severely attacked, while the late-flushing forms suffered least damage.

Considerable differences existed according to position in the stand. At the edge of a lake the degree of damage was much less than in the interior of the stand, and stems of the dominant crown classes suffered less than did suppressed trees, which seems to indicate the sensitivity of nun-moth larvae to the direct rays of the sun and to the influence of wind.

Investigations on the chemical composition of old needles and of young shoots showed that in severely attacked, early-flushing Spruces, the content of tannin and resin was less than in late-flushing trees, but it is probable that variations in the degree of damage are due more to the later flushing than to differences in nutritional value.

[2745]. 45.3 : 12.25 : 13.2 (43.1–5) : 13.15. MORS, H. Aktivität und Frass der Nonnenraupe in den verschiedenen Jahren ihrer Massenvermehrung. **[Activity and feeding of the nun-moth larva in the various years of its epidemic occurrence.]** *Monogr. Z. angew. Ent.* No. 15, 1942 (126–75). [G.g.] I.I.E.

[2746]. 45.3 : 12.25 : 13.2 (43.1–5) : 13.15. MORS, H. Der Nonnenfalter während einer Massenvermehrung. **[The nun-moth during an epidemic.]** *Monogr. Z. angew. Ent.* No. 15, 1942 (176–206). [G.g.] I.I.E.

Deals with the proportion of sexes, the duration of adult life, swarming, mating, and egg-laying.

[2747]. 45.3 : 12.25–8 : 13.2 (43.1–5) : 13.15. WELLENSTEIN, G. Zum Massenwechsel der Nonne. **[On variations in the nun-moth population.]** *Monogr. Z. angew. Ent.* No. 15, 1942 (207–78). [G.g.] I.I.E.

The duration of a nun-moth epidemic is almost always shorter in pure Pine forests than in stands of Spruce, where serious defoliation may take place in several consecutive years in the same stand.

The extent and disposition of infested areas is dependent primarily on local increases in population. Infestation through the movement of larvae or the flight of moths normally takes place only within a circumference of 200 m. at the most. Mass swarming is a sign of overpopulation and trees more than 40 km. distant are rarely infested in this way.

May-to-August temperatures are an important factor in influencing the nun-moth population, but the significance of unfavourable weather in determining the course of an outbreak is generally over-estimated. In Spruce stands, outbreaks may be modified but not prematurely ended by unfavourable weather conditions.

Nutritional factors may either advance or retard the development of the pest. Of the hardwoods, Beech provides the best food for *L. monacha* while Larch is the most favoured of the conifers. The almost simultaneous appearance of leaf and flower buds in conifers creates particularly favourable conditions for the larvae. Where the flower buds appear first, they, with their higher nutritional value, bridge the period between the emergence of the larvae and the appearance of the young shoots. The females, in particular, are adversely affected by unfavourable nutritional conditions, resulting in a lower proportion of females and a lower average number of eggs.

In Pine forests the mortality of young larvae is generally higher than in Spruce stands, as parasites, predators, and fungous diseases appear to be more active in the former. Birds are effective in controlling the nun-moth population only at the edge of the forest.

The conversion of uneven-aged mixed forests to pure even-aged Spruce stands within the range of the nun-moth has substantially increased the frequency of nun-moth epidemics and the severity of the damage caused by this insect.

[2748]. 45.3 : 12.25 : 13.2 (43.1–5) : 13.15. NIKLAS, O.-F. Die Lebensweise der Raupenfliege *Parasetigena segregata* Rond. in der Rominter Heide im Hinblick auf eine biologische Bekämpfung der Nonne. **[The life history of *Parasetigena segregata* in the Rominter Heide with reference to the biological control of the nun-moth.]** *Monogr. Z. angew. Ent.* No. 15, 1942 (359–88). [G.g.] I.I.E.

The possibility of biological control of the nun-moth by means of *Parasetigena segregata* is not good except in the marginal zone of a forest, and artificial breeding would not be profitable. On the other hand, it may contribute substantially to nun-moth control when acting in combination with chemical measures.

[2749]. 45.3 : 12.25 : 13.2 (43.1–5) : 13.15. NIKLAS, O.-F. Schlupfwespen und Nonne in der Rominter Heide, 1933–36. **[Hymenopterous parasites and the nun-moth in the Rominter Heide, 1933-36.]** *Monogr. Z. angew. Ent.* No. 15, 1942 (388–404). [G.g.] I.I.E.

The incidence of parasitism is very low and of no practical importance in control.

[2750]. 45.3 : 12.25 : 13.2 (43.1–5) : 13.15. STEINFATT, O. Die Beziehungen zwischen Vogelwelt und Nonne in der Rominter Heide anlässlich der letzen Massenvermehrung. **[The relationship between bird life and the nun-moth in the Rominter Heide during the last epidemic.]** *Monogr. Z. angew. Ent.* No. 15, 1942 (405–77). [G.] I.I.E.

The article deals with the territory, density of colonization, and residence habits of birds which destroy *L. monacha*, and their variations; the destruction of the pest by various species of birds and the susceptibility of its stages to attack by birds; and the importance of birds to the forest and their practical use in insect-infested areas.

In 1939 the bird life of the Rominter Heide numbered 221 species of which 146 were nesting species, 75 birds of passage, 55 winter species, and 16 of irregular appearance. Most of these species will eat the nun-moth in one or another of its stages of development, but unless they occur in great numbers or depend for their food on a very restricted territory, their influence on nun-moth epidemics is relatively unimportant. A list is given of the chief species responsible for the destruction of the nun-moth. All except two belong to the Passeres.

A large part of the Rominter Spruce and Spruce/Pine forest is unsuitable for hole-nesting birds, since the trees are often unbranched for a half or two-thirds of their height, and natural cavities are practically non-existent. Hence the value of occasional hardwoods in providing suitable nesting places. Nesting-boxes are of great value in attracting birds to infested sites. The lack of correlation between feeding and nesting facilities exists only from spring to autumn. In the cold months, with the gradual disappearance of insects, food shortage sets in, and only a small percentage of the summer bird population can remain alive in the stand without the help of man. By feeding the birds in winter, it is generally possible to obtain their aid in keeping down insect pests throughout the year.

Dusting of infested stands with insecticides, which is usually undertaken during the breeding season of the birds, can cause very serious depletion of the bird population.

In association with parasites and predators, which likewise have a particularly strong influence in the marginal areas of a stand, insectivorous birds are believed to be of great value, at least locally, in preventing the spread of infestation to other areas.

[2751]. 45.3 : 12.25 : 13.2 (43.1–5). WELLENSTEIN, G. Überwachung der Nonne und Vorhersage ihrer Massenvermehrung. **[Surveillance of nun-moth populations and prediction of epidemics.]** *Monogr. Z. angew. Ent.* No. 15, 1942 (478–534). [G.] I.I.E.

The author considers in detail the two methods of prognosis which he regards as of greatest value: (i) the sample counting and sexing of moths from July 1st until the end of the flight period, and (ii) the counting of pupal skins after the end of the flight period. Data are included on procedure and costs. In addition, the advantages and disadvantages of various other methods of prognosis are briefly discussed (counting of eggs, larvae, or pupae; trapping moths; banding of sample trees; artificial breeding in winter to determine the fecundity of the insect; and various quick methods of prognosis). The counting of moths is regarded as the method best suited to general forestry practice. It demands little time and money and can be used in the general census of the nun-moth population as well as during epidemics. From a technical point of view, it is superior to the pupal-skin method, although scientifically it is somewhat less accurate. Preferably the pupal-skin method should be used in combination with the counting of adult moths.

A pupal-skin count in well distributed sample plots is particularly advisable at the beginning of an epidemic.

[2752]. 45.3 : 12.25 : 13.2 (43.1–5). MORS, H. Untersuchungen zur Nonnenprognose Wellensteins und die Bedeutung gradologischer Merkmale. **[Investigations on Wellenstein's nun-moth prognosis and the significance of population increase.]** *Monogr. Z. angew. Ent.* No. 15, 1942 (535–53). [G.g.] I.I.E.

Weighing pupae as a means of determining the number of nun-moth eggs has 3 important disadvantages: (1) dead pupae are frequently included in the samples; (2) the average weight of the pupa increases considerably towards the end of the period of pupation; and (3) the weight of the individual pupa decreases by about 20 to 40 per cent. according to temperature and relative humidity, particularly in the second half of the pupal period. In studying the nun-moth epidemic in the Rominter Heide, a further relationship between pupa and number of eggs was found in the size of the pupal skin. This relationship changes during the course of an epidemic, and is of value in nun-moth prognosis.

[2753]. 45.3 : 12.25 : 13.2 (43.1–5). WELLENSTEIN, G. Vier Jahre Nonnenbekämpfung in Ostpreussen. **[Four years of nun-moth control in East Prussia.]** *Monogr. Z. angew. Ent.* No. 15, 1942 (554–604). [G.] I.I.E.

Poison dusting or spraying is believed to be the most suitable and most effective method of control. Dusts containing arsenic are not recommended, owing to the high concentrations required and the consequent injury to other forms of life. Contact poisons of the derris/pyrethrum group are not effective against the nun-moth. Cresol and phenol dusts, in a single heavy concentration, cause rapid and certain mortality, but, on account of their danger to human beings, many protective measures are necessary. Even in small doses they are fatal to fishes, and, in large doses, to birds and warm-blooded animals. 'Burning' due to dinitro-ortho-cresol dusts may result in a partial fall of the old needles in severely attacked stands, but damage to young shoots is insignificant. On the other hand, considerable damage may be caused to agricultural crops such as turnips, vegetables and potatoes.

Strong measures in the first year of an epidemic are not only more effective but also, in the end, cheaper, than similar measures taken after serious damage has occurred, and poison dusts applied in one concentrated attack are more effective than the same amount of poison applied over a number of days. There is, however, no reason to believe that inadequate poison dusting artificially prolongs an epidemic by postponing the onset of the typical diseases of over-population which would naturally bring about its collapse in due course. On the contrary, the vigour of the larva is weakened by the poison, as is also the vigour of the following generation.

Motor dusters are recommended only for pure, uniform stands of young Pine at the pole stage, and are quite unsuited to Spruce stands with their dense crowns. For Spruce, dusting by aeroplane is much more effective.

The importance of temperature, concentration of the poison, amount of dust applied, and the particular stage of development of the larva, has been shown in numerous experiments. The results may be summarized as follows: (1) The degree of coverage by a dust has a somewhat greater influence on mortality than its actual poison content. (2) At low temperatures the dinitro-ortho-cresol dusts work more slowly, but in the end, just as effectively as at higher temperatures. Low humidity is prejudicial to nun-moth mortality. (3) The particular stage of larval development has a greater influence on mortality than either climatic factors or the various poisons used. The effect of the poison decreases with increasing age of the larva. Larvae about to moult show a greater resistance to poisons than other larvae at the same, or even the following, stage, probably on account of their double skin. (4) An early dusting of 60 kg. per ha. is as effective as a late dusting of 90 kg. per ha. [with 10 per cent. Detal].

Experience in nun-moth control in the Rominter Heide (1933–37) and in central Germany (1939–42) has emphasized the importance of dosage. The following conclusions have been reached: (1) Poison dusting must begin when 90 per cent. of the larvae have ascended the tree and must be completed as soon as possible. (2) The amount of poison used should be carefully adjusted to suit the needle-density of the stand, the stage of larval development and particular difficulties of topography. In general, first doses of 100 kg. or more per ha. assure good results. (3) In comparison with nitro compounds, calcium/arsenic dusts have three serious disadvantages which prevent their use in Spruce stands: they work too slowly, are too dependent on weather conditions, and, in the doses required, are harmful to other forms of life. (4) Owing to uncertainty as to the time of its appearance, larval disease (*Wipfelkrankheit*) cannot be taken into consideration in planning for nun-moth control. (5) The reproductive capacity of the moth is so great that the same areas must be dusted in at least two successive years. In order to reduce stand damage to a minimum, control measures should begin at latest in the fourth 'preparatory' year and be completed early in the first year of the main epidemic.

[2754]. 45.3 : 12.25 : 13.2 (43.1–5) : 91.1. NIKLAS, O.-F. Die Wirkung der Nonnenbegiftung auf die Kerbtierwelt. **[The effect of nun-moth poisoning on insect life.]** *Monogr. Z. angew. Ent.* No. 15, 1942 (645–58). [G.g.] I.I.E.

Stomach and contact poisons caused considerable damage to other forms of insect life

in the crowns of the trees, but the effects varied in severity in different species. The bee population suffered severely in the vicinity of stands treated with arsenic, but dinitro-o-cresol compounds appeared to cause no losses of importance. The population density of the tachinid *Parasetigena segregata* showed a marked decrease following poison-dusting, particularly if dusting took place near the height of the swarming period. Chemical and biological control of the nun-moth can be best combined by adjusting the dusting period so that the swarming period of the tachinid is avoided.

[2755]. 45.3 : 12.25 : 13.2 (43.1–5) : 91.1. STEINFATT, O., and WELLENSTEIN, G. Folgeerscheinungen der Giftbestäubung auf die höheren Tiere und die Pflanzenwelt. [**Effects of poison dusting on the higher animals and on plant life.**] *Monogr. Z. angew. Ent.* No. 15, 1942 (659–81). [G.g.] I.I.E.

Poisoning by arsenic dusts as a result of forest dusting at Rominten was particularly severe in cattle and birds, whereas wild animals appeared to suffer comparatively little injury. Heavy losses of birds occurred with applications of more than 50 kg. of 12- to 17-per-cent. calcium arsenate per ha. Nestlings apparently starved as a result of the poisoning of the parents. Chemical investigations indicate that the lethal dose of arsenic for small birds is substantially less than was previously supposed.

Contact poisons containing dinitro-orthocresol, even in large doses, caused no perceptible damage to higher animals. On the other hand, 'burning' of plants was more severe than was at first believed, cultivated crops (e.g. turnips and cabbage) being particularly affected.

Both calcium arsenate and dinitro-orthocresol poisons, therefore, are harmful when applied at rates of more than 50 kg. per ha., but 'burning' of plants by the cresol poisons is the easier to avoid and is a less permanent form of damage. Contact poisons also have a more rapid effect on the nun-moth larvae.

[2756]. 45.3 : 12.25 : 13.2 (7) : 60.31. WESTVELD, M. **Forest management as a means of controlling the Spruce budworm.** *J. For.* 44 (11), 1946 (949–53). [Northeastern Forest Exp. Sta., Philadelphia, Pa.]

A general account of the present movement to control Spruce budworm by proper forest management, and particularly by cutting methods designed to cut the most susceptible areas first, to remove old defective Balsam Firs from cut-over areas, to convert Spruce/Fir stands to pure Spruce, and to reduce the present cutting cycles of 40–60 years to 20 or less years.

[2757]. 45.3 : 12.25 : 13.2 : 45.4. BERMUDA. **Report of the Plant Pathologist for the year 1945.** Department of Agriculture, Bermuda. 1946. pp. 12.

Two more introduced species of scale insects have been discovered during 1944–45 in the association attacking *Juniperus bermudiana* [cf. *For. Abstr.* 7 (No. 2063)]. *Lepidosaphes newsteadi* Sulc. is locally serious but some strains of the Juniper are resistant. *Diaspis visci* Schr. is a widespread species; two of its parasites, *Aspidiotiphagus citrinus* and *Aphytis mytilaspidis*, are already present in Bermuda on other hosts. The mite, *Paratetranychus ununguis* Jac., can be checked by spraying with 2-per-cent. oil emulsion and by thinning and pruning the Juniper. Extended investigations of control measures for Bermuda Cedar pests are planned (pp. 2, 3).

[2758]. 45.3 : 12.25 : 13.2. ESCHERICH, K. Biologische Bekämpfung der Lärchentriebmotte (*Argyresthia laevigatella* H.S.). [**Biological control of the Larch shoot moth.**] *Z. angew. Ent.* 30, 1944 (146–7). [G.]

Instead of burning attacked shoots, those containing parasitized caterpillars were collected and stored under shelter in attacked Larch stands until the parasites emerged in June. An improvement was noticed in the following year.

[2759]. 45.3 : 12.25 : 13.2. PETERSON, L. ***Chionaspis pinifoliae* Fitch.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Canada.* 2 (6), 1946 (3).

The Pine needle scale is a serious pest of Spruce in farm shelterbelts in the Prairie Provinces. The generation is annual with overwintering in the egg stage. Of the many insecticides tested, lime sulphur proved the most satisfactory, though it is effective only against the 'crawling' stage and the early 'settled' stage, so that the period in which efficient control can be obtained is very short. In the hope of overcoming this handicap, DDT and 666 were tested during 1946. DDT (20 per cent.) was used at 2½ lb. and 7½ lb. to 100

gallons of water, and 666 (6 per cent. gamma isomer) at 4 oz., 8 oz., and 2½ lb. to 100 gallons of water. Applications were made periodically from June 5th, when hatching was well under way, until August. Dry lime sulphur at 1 lb. to 12 gallons of water was also applied for comparative purposes. Both DDT and 666 at the concentrations used appeared to be quite ineffective even in the earlier developmental stages, whereas the dry lime sulphur concentration again gave efficient control against the 'crawling' and early 'settled' stages.

[2760]. 45.3 : 12.25 : 13.2 : 13.12. BALCH, R. E. **The disease of the European Spruce sawfly.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Canada* 2 (5), 1946 (1).

Studies made at the Acadia Forest Experiment Station indicate that the most important factors at present controlling the numbers of European Spruce sawfly [*Diprion polytomum*] in the Maritime Provinces of Canada are the disease and introduced parasites (*Sturmia* sp. and *Exenterus* sp.). Histological studies have shown that when the feeding larvae are infected too late to be killed before forming the cocoon, the stages in the cocoon, and also the adult, show signs of the disease. Experimental work is now in progress to determine the process by which the disease is transmitted to the offspring. Dried extract of diseased larvae has been used to establish the disease in Newfoundland. It has been shown that ordinary methods of sampling the larval population are entirely unreliable as an indication of the presence of the disease or the percentage of infection. The use of sterile methods of collecting and rearing has demonstrated that samples showing no outward symptoms may be 25 per cent. or more infected. On the other hand, mass rearing of collections may result in high degrees of infection after collection.

[2761]. 45.3 : 12.25 : 13.2. **Report of the Chief of the Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, 1945.** U.S. Govt. Printing Office. 1946. pp. 63.

The outbreak of Engelmann Spruce beetle [*Dendroctonus engelmanni*] in Colorado continued unabated, killing over 1 billion bd. ft. of Engelmann Spruce in 1944, and extensive surveys show that the outbreak is increasing in area and severity. The discovery that this species hibernates beneath the bark at the base of trees during its second winter, a habit unknown in closely related beetles, has an important bearing on control methods (p. 33).

[2762]. 45.3 : 12.25 : 13.2 (76.6). AFANASIEV, M., and FENTON, F. A. **Pine tip moth and its control in Oklahoma.** *J. For.* 45 (2), 1947 (127–8).

On the basis of the results secured from applications of DDT in experimental plantations during the spring and summer of 1946, the authors believe that one or two thorough sprayings of Pines timed to coincide with the emergence of first and second generations of the Pine tip moth (*Rhyacionia frustrana*) will give adequate control of this insect.

[2763]. 45.3 : 12.25 : 13.2 : 24.3. FYFE, H. A., and LEJEUNE, R. R. **Jack Pine budworm.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Canada.* 2 (6), 1946 (3).

Long-term studies to determine the influence of Jack Pine pollen production on budworm abundance [cf. *For. Abstr.* 8 (No. 705)] made in the Prairie Provinces from 1942 to 1946 show that the bud-worm populations fluctuate directly with pollen production. The percentage of staminate trees in a stand can and does differ markedly from year to year.

[2764]. 45.3 : 12.25 : 13.2 (71.1 : 71.11). HOPPING, G. R. **The Lodgepole Pine needle miner in the Canadian Rocky Mountain Parks (Lepidoptera, Gelechiidae).** *Repr.* from *Proc. ent. Soc. B.C.* 42, Dec. 8th, 1945. pp. 2.

A brief account is given of *Recurvaria milleri*, its life history, and the history of the present outbreak in Banff National Park, Alberta, on *Pinus contorta*, which has been in progress since 1942. So far, the recovery of the trees has been satisfactory except in one small area. Young trees appear to be more resistant than old ones. Examination of over 12,000 needles showed parasitism to be less than 20 per cent.

[2765]. 45.3 : 12.25 : 13.2. STRUBLE, G. R. **Twig damage in Sugar Pine caused by the cone beetle.** *J. For.* 45 (1), 1947 (48–50). [U.S. Bureau of Entomology and Plant Quarantine.]

The Sugar Pine cone beetle (*Conophthorus lambertianae*) is normally a destructive pest of immature cones of *Pinus lambertiana*; recent

observations show that it mines twigs and causes limited damage to the crowns of Sugar Pines of varying age and vigour. In certain years at least part of the cone generation emerges in August and September, instead of hibernating, and attacks the twigs.

[2766]. 45.3 : 12.25 : 13.2 (485). BUTOVITSCH, V. Redogörelse för flygbekämpningskampanjen mot tallmätaren under åren 1944–45. **[Report on the campaign for aerial control of the Pine looper [*Bupalus piniarius*] in 1944–45.]** *Medd. Skogsforskn-Inst.* [*SkogsförsöksAnst.*], *Stockh.* 35 (9) 1947. pp. 108. [Sw.sw.g.]

A detailed report on aerial dusting with Gesarol (DDT) [cf. *For. Abstr.* 7 (No. 1419)]. In 1944 a Junker W34 seaplane was used, and in 1945 a Focker S6 land-plane with new and simplified dusting apparatus. The kill was assessed by daily measurement of the catch in excrement traps before, during and after dusting. At Hökensås 965 ha. were dusted in late August at an average rate of 7·1 kg./ha. Weather was rather unfavourable (windy) and some areas had to be dusted in spite of thermal air disturbances. The average kill was 96 per cent. for the whole area, but only about 50 per cent. where conditions had been unfavourable. At Vissboda 205 ha. were dusted at a rate of 8·3 kg./ha. on Sept. 4th, and though rain set in 6 hours later, the larval population was reduced by 81 per cent. Two areas near Tullinge, totalling 120 ha., were also dusted on Sept. 7–8th, one at 7·5 kg./ha. and the other (less heavily infested) at 3·7 kg./ha. Weather was fine during the operation, and though rain followed and rendered measurement of excreta impossible, results appeared good as no important fresh damage to the forest had been detected by late autumn of 1944.

No poisoning of birds or other warm-blooded animals was observed in the treated areas, neither did there appear to be any injury to bees of a hive placed in the dusting area at Hökensås.

Surveys of pupal frequency and of the damage done in 1944 showed that Vissboda was substantially free of recent damage and of pupae; no further measures were thought necessary here and no feeding of larvae was observed in the summer of 1945. At Hökensås pupal frequencies on areas dusted under good meteorological conditions were practically zero, but new foci had arisen, some (355 ha.) outside the treated area and some (183 ha.) in the areas dusted under poor conditions, pupal frequencies being considerable on the last-named. Parasitized and diseased pupae increased from 20 per cent. in 1944 to 63 in 1945, but the number of healthy pupae on areas totalling about 240 ha. indicated the need for a second dusting. This took place in mid-August over 228 ha. Persistent rain before and after the operation did not allow of excrement sampling, but from the condition of the forest in summer–autumn 1945, it appeared that damage had ceased and the outbreak was virtually at an end.

During both years, observations were also made on *Myelophilus* attacks, from which it is concluded that: (*a*) Stem damage by this beetle was in general of minor importance. (*b*) Attacks were mostly concentrated on the most seriously damaged (completely defoliated) areas. (*c*) Trees killed by *Myelophilus* belonged to smaller diameter classes and usually had narrower crowns than those unattacked by the beetle. (*d*) Trees with unsuccessful *Myelophilus* attack soon recovered and showed no signs of weakening. (*e*) During the two years, *Myelophilus* attacks tended to increase at Hökensås and to decrease near Tullinge, a fact which is attributed to absence of Pine-looper attack in the latter district in 1944 and to the consequent improvement in the resistance of the stands to the beetle. The building up of resistance in the recovering stands should be hastened by the normal measures against *Myelophilus*, viz. felling of attacked trees and barking of thick-barked logs about 6 weeks after the swarming period.

[2767]. 45.3 : 12.26–8 : 13.2 : 12.12 : 45.4. LIZER Y TRELLES, C. A., and MOLLE, C. C. Estructura anatómica de filocecidias neotropicas. **[Anatomical structure of neotropical plant galls.]** *Lilloa* 11 (1), 1945 (153–87 + plates). [Span.e.] A.P.B.

Psylla duvauae, *Calophya gallifex* and *Tainarys schini* on *Schinus polygamus*; *Trioza ocoteae* on *Ocotea acutifolia*; and *Eriophyes brethesi* on *Wedelia glauca*.

[2768]. 45.3 : 12.26–8 : 13.2. PETERSON, L. O. **Fall cankerworm egg mortality.** *Bi-m. Prog. Rep. For. Insect Invest. Dep. Agric. Canada* 2 (5), 1946 (3).

In studies of the fall cankerworm, *Alsophila pometaria*, in the Prairie States of Canada, it

was observed that a very high percentage of the eggs failed to hatch. Infertility may have been a cause, but it is surmised that weather was largely responsible. Whatever the reasons, it is quite possible that they are the major factors in the natural control of this insect in the Prairie Provinces.

[2769]. 45.3 : 12.26–8 : 13.2 : 13.15. HODSON, A. C., and WEINMAN, C. J. **Factors affecting recovery from diapause and hatching of eggs of the forest tent caterpillar, *Malacosoma disstria* Hbn.** *Tech. Bull. Minn. agric. Exp. Sta.* No. 170, 1945. pp. 31.

A study of the effect of temperature on the termination of an embryonic diapause of *Malacosoma disstria* has shown that the diapause lasts for about three months after embryonic development is complete. When the histological changes associated with yolk absorption were compared with hatching data it became evident that temperature had little effect on the diapause, and, instead, temperature influenced the course of developments after the diapause was broken.

A further study of post-diapause development showed that temperatures covering a range of 10° to 25° C. were nearly equally favourable for hatching, the optimum conditions being found in a saturated atmosphere at 15° C. Over the range of favourable temperatures the best moisture conditions were found to lie between relative humidities of 70 and 100 per cent.

The eggs of *M. disstria* are not very resistant to desiccation, for hatch was reduced considerably after eight days of drying over calcium chloride at 23° to 26° C., and no hatch took place after 32 days of desiccation. This experiment offered further evidence that the degree of hardness of the chorion is a determining factor in the escape of the larva from the egg. *From authors' summary.*

[2770]. 45.3 : 12.26–8 : 13.2. **Report of the Chief of the Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, 1945.** U.S. Govt. Printing Office. 1946. pp. 63.

In tests made in 1944 [cf. *For. Abstr.* 7 (No. 958)] it was found that 5 lb. of DDT in 5 gal. of spray per acre gave complete control of the gypsy moth [*Lymantria dispar*], but the tests made in 1945 have shown that much smaller dosages are effective. In these later tests the moth was controlled with $\frac{1}{4}$ lb. of DDT in 1 gal. of solvent per acre. This season's work has demonstrated conclusively that DDT is the most effective and economical insecticide discovered for control of the gypsy moth, and its distribution by aircraft and improved spray equipment offers for the first time a practical means of controlling woodland infestations of this insect (p. 15).

[2771]. 45.3 : 12.26–8 : 13.2 : 07.7. LATTA, R. **Field experiments with heat-generated aerosols.** *J. econ. Ent.* 39 (5), 1946 (614–9). [U.S. Bureau of Entomology and Plant Quarantine.]

The behaviour of aerosol clouds when applied to forested areas was studied in 1944–45 by observing their action on general infestations of larvae of the gypsy moth (*Lymantria dispar*). Two thermal generators were used, a military oil fog generator and a Hochberg-LaMer aerosol generator. Successful applications were effected only when a steady wind of 10 m.p.h. or more existed above the forest canopy, or under good inversion with an evening air drainage down a mountain slope. Complete mortality was obtained at a depth of 800 ft. with as little as 0·138 oz. of DDT per front foot. Aerosols produced in the Hochberg-LaMer generator left a deposit which in some instances remained repellent for the remainder of the feeding season. Methods of applying aerosols to individual roadside or garden trees are discussed. *Author's summary.*

[2772]. 45.3 : 12.26–8 : 13.2 (43.7) : 13.15. JAHN, E. Über das Auftreten von *Tortrix viridana* L. im Gebiet der Pollauer Berge und die Parasiten und Räuber dieses Schädlings. **[On the occurrence of *Tortrix viridana* L. in the Pollauer Berge district and the parasites and predators of this pest.]** *Z. angew. Ent.* 30, 1944 (252–62). [G.g.] [Institut für Forstentomologie und Forstschutz der Hochschule für Bodenkultur in Wien.]

The 1941–42 outbreak was characterized by an almost complete absence of parasites and disease but predators were abundant and appreciably checked the defoliators.

[2773]. 45.3 : 12.26–8 : 13.2 (67.5). VAYSSIÈRE, P. Un *Cerococcus* nouveau nuisible au caféier au Congo belge. **[A new *Cerococcus***

injurious to the Coffee tree in the Belgian Congo.] *Rev. Zool. Bot. afr.* 39 (4), 1946 (376–80). [F.]

[2774]. 45.3 : 12.26–8 : 13.2 (67.5 : 67.6) : 42.5. GHESQUIÈRE, J. Biogéographie et pathogénie de *Cerococcus coffeae* Vayss. en Afrique tropicale (Hem. Coccidae). [**Distribution and pathogenicity of *Cerococcus coffeae* in tropical Africa.**] *Rev. Zool. Bot. afr.* 39 (4), 1946 (374–5). [F.]

This new species [cf. preceding abstract] has been found in the Belgian Congo, Kenya, and Tanganyika. Its presence in any considerable numbers on the trees of a Coffee plantation, is a symptom of deficiency of the soil in humus and consequently in assimilable K_2O. The trees on severely infested plots showed evident signs of potassium deficiency and analysis of soil samples confirmed this diagnosis.

[2775]. 45.3 : 12.26–8 : 13.2 : 13.15. BEIRNE, P. B. **Notes on the biology of some hymenopterous parasites of the Beech weevil (*Rhynchaenus fagi* L.) (Col.).** *Proc. R. ent. Soc., Lond.* 21A (1/3), 1946 (7–11). I.I.E.

Triaspis (*Sigalphus*) *pallidipes* Nees and *Colastes braconius* Haliday in Ireland.

[2776]. 45.3 : 12.26–8 : 13.2. PARR, T. J., and BAKER, W. L. **Tests of DDT on certain sucking insects associated with Elm.** [*Publ.*] *U.S.Bur. Ent.* No. E-667, 1945. pp. 7.

In laboratory tests it was found that prolonged exposure to DDT emulsions in concentration as low as 0·125 per cent. effectively killed many species of Cicadellids and certain Membracids, Fulgorids, and Cercopids associated with the American Elm. However, a concentration as high as 2 per cent. was required to kill 100 per cent. of these insects when they were exposed to the material for only 10 minutes. Insect populations on Elm trees, grass, and other herbaceous vegetation were effectively reduced for at least a month when field plots were sprayed with 0·25-per-cent. DDT emulsions in late September. No injury to Elm foliage occurred in any test involving the use of DDT emulsions. *Authors' summary.*

45.4. *Other Animals*

See also *For. Abstr.* 8 (Nos. 2757, 2767).

[2777]. 45.4 : 12.25–8 : 13.2 (73). KEIFER, H. H. **A review of North American economic Eriophyid mites.** *J. econ. Ent.* 39 (5), 1946 (563–70). [California State Department of Agriculture, Sacramento.]

47. INJURIES OF ALL KINDS TO INDIVIDUAL TREE SPECIES

[2778]. 47 : 12.25 (77.1). SWINGLE, R. U. **Chlorotic dwarf of Eastern White Pine.** *Plant Dis. Reptr.* 28 (26), 1944 (824–5). [U.S. Bureau of Plant Industry, Columbus, Ohio.] I.M.I.

Chlorotic dwarf is a particularly common disease in 2- to 15-year-old *Pinus strobus* plantations in Ohio. Affected trees usually die after a period of decline of 3 to 5 or more years. The symptoms of the disease are described. Isolation attempts and histological studies over a period of several years have so far failed to reveal any associated organism. The transplanting and watering of diseased trees has also failed to induce recovery.

[2779]. 47 : 12.26–8 (71.4 : 71.5 : 71.6) : 45.3 : 13.2. BALCH, R. E. **The problem of the dying Birch in Eastern Canada.** *Pulp Paper Mag. Can.* 47 (13), 1946 (104–5). (*Contr. Div. Ent. Dep. Agric. Can.* No. 2465).

A short account of the die-back of Birch in Eastern Canada, its relation to the bronze Birch borer, and recommended methods of control by proper management.

5. MENSURATION. INCREMENT. YIELD

52. MEASUREMENT OF TREES AND TIMBER

52.2. *Height. Length*

See also *For. Abstr.* 8 (Nos. 2802–4, 2811).

[2780]. 52.2 : 07.7. TIWARI, S. D. N. **A new hypsometer.** *Indian For.* 72 (10), 1946 (462–5).

Includes sections on the construction and use of the instrument, the theoretical principles on which its working is based, and its advantages over other types of hypsometers. The addition of certain accessories converts it into a disto-clino-hypsometer capable of measuring distances, angles and heights.

52.3. *Form. Taper*

See also *For. Abstr.* 8 (No. 2408).

[2781]. 52.3 : 52.43.3. SIMONSSON, B. En stamkurveekvation av potenstyp. [**A taper-curve equation of a geometric power type.**] *Svensk SkogsvFören. Tidskr.* 44 (6), 1946 (496–506). [Sw.e.]

The taper equations at present in use, based on hyperbolic, trigonometric and logarithmic functions, fail to express certain properties of stem curves. A good curve should have, for the lower part of the stem, a variable point of inflection, and should be adjustable with precision to at least 3 points—the two form-class diameters and an intermediate point—and preferably also to a point above the upper form-class diameter. Using the true form quotient and the points 0·3, 0·5, 0·7 and 0·9 of tree height reckoned from the top, the author derives the following equation which satisfies the requirements:

$$\frac{d}{D} = l^{\left(\frac{l}{K}\right)^{Cl(l^n+v)^e}}$$

where $\frac{d}{D}$ is the diameter quotient when D is at stump height, l is the height quotient with 0 as the top and 1 as stump height, K, C, n and v are constants whose significance and application are considered in detail. The equation is less cumbersome than it appears, a single solution taking not more than about 3 minutes with a slide rule. Results of a trial application to Spruce are discussed and tabulated.

[2782]. 52.3 : 52.43.2 : 21.6. GRAY, H. R. **The form and taper of forest tree stems.** *Abstr.* in *Aust. Timb. J.* 12 (8), 1946 (461).

Radically different in habit though such species as, for example, Eucalyptus, Redwoods, Kauris, Pines, Firs, Spruces, etc., may be, they appear to have a basic similarity of shape which conforms to the hypothesis here presented, viz.: 'The area of the stem of a forest grown tree is proportional to the stress on it.' This hypothesis is supported by a large body of evidence from thousands of trees of different species growing in a variety of soils, climates and environments, and has also been stated independently on theoretical grounds. The hypothesis has two outstanding practical advantages: (1) it leads to a chain of rationally based simplifications of procedure in growth and yield studies; (2) it allows factors causing variations from the norm to be isolated on a rational basis and estimated on a quantitative basis.

52.4. *Measurement of Volume*

[2783]. 52.4 (44). SCHAEFFER, L. U., tournant dans l'histoire de la dendrométrie en France. Normalisation du cubage des grumes et des arbres sur pied. [**A turning-point in the history of tree-measurement in France. Standardization of the mensuration of logs and standing timber.**] *Rev. Bois Appl.* 1 (9/10), 1946 (11–14). [F.] P.R.

The article contains a short review of the history of forest mensuration in France. A new standard for measuring logs in the rough—*Norme française* B53–015—which appeared in 1945, is described and discussed. A standard for the estimation of the volume of standing timber, which is still in the form of a project is also dealt with.

[2784]. 52.43 : 12.26–8 (73) : 31.8. ZILLGITT, W. M., and GEVORKIANTZ, S. R. **Estimating cull in northern hardwoods.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 3, 1946. pp. 7.

The study here reported was undertaken in 1944. Data were collected from 600 Sugar Maple trees in Alger and Marquette Counties, Michigan. The sample trees were examined and scaled after felling and cross-cutting, and each of the 950 defects encountered was carefully examined and the outward indication of it described. The total loss in volume for each defect was then calculated and a table prepared showing percentage of cull caused by the various forms of defect. The application of this table is explained.

[2785]. 52.43 : 12.26–8 (73) : 31.8. GEVORKIANTZ, S. R. **Guide for estimating defect in northern hardwoods.** *J. For.* 45 (2), 1947 (128–30). [Lake States For. Exp. Sta.]

A method of estimating cull in standing trees of northern hardwoods based on a study made in 1944–45 [see preceding abstract]. A table of defect factors is given: the suggested procedure consists in examining each sample tree, recording its d.b.h., usable length and defect class (four such classes are recognized), and then looking up relative weight and defect factor in the table.

[2786]. 52.43.3 : 12.25 (67.6). **Volume table for *Podocarpus gracilior*.** *Pamphl. For. Dep. Kenya* No. 12 [*n.d.*] pp. 3.

[2787]. 52.43.3. LEXEN, B. **The determination of net volume by sample-tree measuring.** *J. For.* 45 (1), 1947 (21–32). [Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.]

The application of sampling to tree measuring is slightly more complicated than its application to log scaling, because it requires the selection of two samples instead of one. The first sample is large and the second, drawn from the first, is small; the purpose of the first is to furnish a first estimate of total net volume, and that of the second is to furnish the information necessary to convert the first estimate to the final estimate of total net volume within a specified limit of error. The important point in sample-tree measuring is that the small sample is always selected at random among the trees marked for cutting. The small sample includes, in addition to the estimated volume, the net volume of each tree also. By establishing the relationship between net and estimated volume from the small-sample data, a simple means of converting estimated volume to net volume is made available. The number of trees in the large sample is about 2,000, and estimates of their volume are made at the time of marking. The number of trees required in the small samples depends to a large extent upon the defectiveness of the timber. In sound timber, with reasonably good estimating of height and measuring of d.b.h., 100 trees are adequate. If there is defect of 30–35 per cent., the small sample must be increased to about 400 trees. It is possible to reduce the size of the small sample by: (1) eliminating cull trees from the computation of net volume; (2) deducting all detectable defect from the volume of the trees in the large and small samples; (3) establishing a separate net/estimated volume relationship for each species or age class if the amount of defect varies considerably between them; and (4) classifying trees by two or more defect classes and establishing the net/estimated volume relationship for each class. The article analyses, step by step, from actual field trials, the accuracy attained by alternative methods in the sampling process, and concludes with instructions for efficient practical application of the results.

[2788]. 52.43.5 (71). ROBERTSON, W. M., and MULLOY, G. A. **Sample plot methods.** Dominion Forest Service, Ottawa, Canada. 1946. pp. 69 + map.

Since the issue in 1924 of the Forest Research Manual, there has been a considerable development in this field, and many modifications and improvements have been made in research methods. The present publication is designed to cover particularly the subject of sample plot methods and to standardize methods of compiling field data.

52.46. Strip Surveys. Enumerations. Timber Cruising

[2789]. 52.46 : 01.7. BARTON, W. W., and STOTT, C. B. **Simplified guide to intensity of cruise.** *J. For.* 44 (10), 1946 (750–4).

The authors present a chart showing the intensity of cruise needed to ensure an approximate 10- to 15-per-cent. accuracy when cruising stands of good uniformity and density, 15- to 20-per-cent. accuracy when cruising stands of average uniformity and density, and 20- to 25-per-cent. accuracy when cruising most stands of poor uniformity and density. The chart is also expanded in a table to show the cruising intensity for both better and poorer standards of accuracy. The basic formula from which the chart is plotted may be transposed into one useful in determining the probable accuracy of a completed cruise. This is as follows:

$$e = \sqrt{\frac{A - Na}{AN}} \times f$$

where e is percentage of accuracy desired, expressed as a decimal; N is the number of plots; a is the area of one plot in acres; A is the total area of the tract in acres; and f is the timber-stand factor (for determining which, a table is provided).

53. SOLID CONTENTS OF STACKED MATERIALS. REDUCING FACTORS

[2790]. 53. MEYER, H. A. **Bark volume determination in trees.** *J. For.* 44 (12), 1946 (1067–70). [Pennsylvania State College, Pa.]

The author explains methods of calculating bark volume, which he has found useful when working with Cinchona. The bark volume of a

tree is conveniently computed as the difference between the volume of the tree including bark and the volume of the tree excluding bark, and may be obtained by multiplying the volume of the tree including bark by the factor $(1 - k^2)$, where k is a constant representing the regression coefficient of d (diameter inside bark) on D (diameter outside bark). It has been established experimentally that, except possibly in trees of unusually large girth, this ratio can be safely assumed to be a linear regression. Details are given of the calculation of k and construction of volume tables for *Cinchona pubescens*, based on measurements of 61 individuals. Values of k and cubic-foot bark volume in per cent. of total volume $(1 - k^2)$ are given for *C. pubescens* and *C. tucuyensis* in Venezuela, and Hemlock, White Pine, White Oak, Red Oak, Black Oak, Scarlet Oak, Chestnut Oak, and Red Maple in Pennsylvania.

54. FACTORS CONNECTED WITH ASSORTMENT

[2791]. 54 : 33.53 : 12.25 (73). TIMM, J. L. **Conversion of standard pole classes to tree diameters in Lodgepole Pine.** *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 39, 1946. pp. 2. P.R.

A table gives average minimum diameter at breast height (measured outside the bark) of Lodgepole Pine against the class and length of pole which the tree will make according to the standards of the American Standards Association.

55. AGE

See also *For. Abstr.* 8 (No. 2811).

[2792]. 55 : 12.26–8 : 56.02 : 31.1. HUMMEL, F. C. **The formation of growth rings in *Entandrophragma macrophyllum* A. Chev. and *Khaya grandifoliola* C.DC.** *Emp. For. Rev.* 25 (1), 1946 (103–7).

Blocks of wood were removed at monthly intervals for 12 months from 2 trees in the Gold Coast, one of *Entandrophragma macrophyllum* and one of *Khaya grandifoliola*. *Entandrophragma* spp. have definite growth rings consisting of concentric bands of parenchyma. In the tree of *E. macrophyllum*, such bands were formed at the beginning of each of two consecutive growing seasons and at no other time. It appears, therefore, that ring counts may be expected to give a fairly reliable estimate of age in most species of this genus. In *Khaya* spp. growth rings are often discontinuous, and in the tree of *K. grandifoliola* it was not possible to correlate their formation with seasonal periodicity of growth; their value for estimating age thus appears to be very doubtful. *Author's summary.*

56. INCREMENT

See also *For. Abstr.* 8 (Nos. 2368, 2451, 2470–1, 2815).

[2793]. 56 : 12.26–8. NORTHERN RHODESIA. **Department of Agriculture: annual report for the year 1945.** Govt. Printer, Lusaka. 1946. pp. 28.

Seedlings of Mukusi (*Baikiaea plurijuga*) have a habit of dying back for no apparent reason and then resuming growth from the rootstock. Over 50 per cent. of the seedlings on sample plots have either died or died back over a 7-year period. The mean annual height increment in the remainder is only 2 in. in the smaller classes, slowly rising to 5–6 in. as the seedlings reach 6 ft. in height, by which time it would appear that they must be 20 years of age. Available records of girth increment show an almost equally slow rate of growth in later life, and even trees between 15 and 45 in. girth have an average girth increment of less than $\frac{1}{2}$ in. per annum (pp. 18–19).

[2794]. 56.02 : 07.7. BROWN, C. T., ROSE, R. C., and SPURR, S. H. **The dial gauge dendrometer as a tool in silvicultural research.** *J. For.* 45 (2), 1947 (102–4). [Harvard Univ., Petersham, Mass.]

A report on the very satisfactory results of the use of the dial gauge dendrometer developed by Reineke and improved by Daubenmire [cf. *For. Abstr.* 7 (No. 446)] in the Harvard Forest. It is estimated that 50–100 readings may be made per hour to an accuracy of $\frac{1}{1000}$ of an inch.

[2795]. 56.2 : 57 : 12.25 : 23.24.3. BICKERSTAFF, A. **Balancing maximum increment per tree against maximum increment per acre.** *Silvic. Leafl. Dom. For. Serv.* No. 22, 1946. pp. 2.

If the average increment for 3 or more representative groups of trees distributed over the possible range of spacings is available, the question of what spacing or number of trees

per acre will produce the greatest increment per acre, is answered very rapidly by a simple graphic method. The average basal-area increment per tree is plotted over the number of trees per acre corresponding to the average spacing of the group, and a regression line drawn through the points. A second curve showing corresponding increments per acre is prepared from the first curve by multiplying the number of trees per acre represented by each ordinate by the increment per individual tree occurring at that ordinate and then plotting the value so obtained. For most data the result is a bell-shaped curve whose crest represents the number of trees per acre at which the stand should be carried to obtain maximum increment for the period under study.

57. DEVELOPMENT AND STRUCTURE OF STANDS. YIELD

See also *For. Abstr.* 8 (Nos. 2813–5).

[2796]. 57 : 12.25 : 56 : 12.19.4. MUNGER, T. T. **Watching a Douglas-Fir forest for thirty-five years.** *J. For.* 44 (10), 1946 (705–8).

Data are presented on the growth of 3 sample plots laid down in 1910 in a 54-year-old, second-growth Douglas-Fir forest on the lower slopes of the Cascade Range, Oregon, and measured at 5-year intervals. Comparison of the values for these plots with those of standard yield tables shows that all three plots have tended towards normality in all units of measurement. By Scribner board foot measurement the plots are now 96, 95 and 100 per cent. of normal, having started in 1910 at 88, 105, and 110 per cent. respectively. Though no seed-bearing Hemlocks occur on these plots or were noticed in the immediate neighbourhood, Hemlock seedlings are beginning to appear in the understorey and Plot 2 has 5 recruits that have reached the 2·6-in. diameter group in the last 5 years. This is the beginning of the process by which the tolerant Hemlock, Cedar, and Balsam Fir infiltrate the intolerant Douglas Fir and ultimately replace it in the climax type. Though thousands of Douglas Fir seedlings have germinated on these plots every 2 or 3 years, there is not a single established seedling or sapling on the 3 acres now.

6. MANAGEMENT. WORKING PLANS. SURVEYS

[2797]. 6 : 02.1 : 7. JERRAM, M. R. K. **A textbook on forest management.** Chapman & Hall Ltd., 37 Essex Street, London, W.C.2. 2nd impr., 1945. pp. 154. Price 12*s.*

61. SURVEYING. MAPPING

See also *For. Abstr.* 8 (No. 2280).

[2798]. 61.32 : 07.7. PIKALKIN, V. M. Primenenie dirizhablya v lesnoy promÿshlennosti. **[Use of the dirigible in the forest industry.]** *Lesnaya Prom.* No. 10/12, 1945 (5–8). [Russ.]

Results of an experimental trip made in June, 1945, over burned areas of forest in Kirov Oblast', are strongly in favour of the use of dirigibles in Russian forest survey operations. The ship was based more than 1,200 km., or 14 flying hours, from the working site. In 7 days 226,000 ha. of fire-killed forest were surveyed. The quality of the work was far better than could have been got from aeroplanes. The latter, flying at heights of 400–500 m., obtain reasonably accurate determinations of boundaries and fair estimates of composition and density. Dirigibles, however, can fly very low over the tree tops at speeds of 0–100 km. per hour, thus rendering possible accurate estimates not only of density and composition but also of age and height (and consequently of site quality) and even of the average diameter and quality of stands. On the trip in question the three surveyors on board each had a table and working map and were able to produce, during flight, a 1 : 50,000 map requiring no further work other than inking in.

The advantages claimed for the dirigible are economy in time and costs compared with ground surveys, access to otherwise inaccessible places, greater accuracy, saving in manpower, the possibility of working the year round, and utility for other purposes such as transport of men and supplies. If ground personnel are used for starting, etc., they can be put to other jobs when not so required. Mooring masts would practically eliminate the need for ground personnel. In the present instance a ground crew was used and the ship was moored in

forest bivouacs, where winds up to 20 m. per sec. caused no trouble. Hydrogen supplies could be obtained from portable generators (capable of producing 120 cu.m. per hour, while the consumption of the ship used was not above 40 cu.m. per 24 hours). The costs per flying hour based on only 600 flying hours per annum is about 400 roubles. The corresponding figure for the Russian PO–2 aeroplane is 250 roubles, but this carries only one observer as compared with the dirigible's three.

[2799]. 61.32 : 12.19. COLWELL, R. N. **The estimation of ground conditions from aerial photographic interpretation of vegetation types.** *Photogram. Engng.* 12 (2), 1946 (151–61). L.S.

In estimating ground conditions, the interpreter of air photographs can make valuable use of his knowledge of the ecological habits of the various species of vegetation identifiable. E.g. Mangrove trees indicate muddy, salt-water swamps; Casuarinas, firm sandy beaches; Sago Palms, fresh-water swamps. Notes are given on some examples of such interpretation in the Solomon Islands.

[2800]. 61.32 (71.3). BRODIE, J. E. **Ontario has its picture taken.** *Sylva, Toronto* 2 (3), 1946. (50–6).

The Forest Resources Inventory which is being made for the Province of Ontario, will include a complete and accurate planimetric map, land-use map, and a timber estimate. The basis of the inventory, which will cover an area of 140,000 sq. miles and include all the forest land at present accessible, will be aerial photography. The whole programme of photography and planimetric mapping, which will take 5 years, will be carried out by a commercial company. The full amount of aerial photography has been completed for the 1946 season and work is proceeding on maps and timber estimates. Four twin-engine Anson V aircraft, equipped with Williamson Eagle and O.C.E. cameras, were in operation. A full summary of the specifications for aerial photography and mapping is given.

[2801]. 61.32. SPURR, S. H., and BROWN, C. T., JR. **Specifications for aerial photographs used in forest management.** *Photogram. Engng.* 12 (2), 1946 (131–41). L.S.

An investigation was made by the Howard Forest in collaboration with the Northeast Forest Experiment Station and the Canadian Dominion Forest Service, to determine the type of photograph best suited to forestry use. The present study deals with the relative value of different types of photography in quantitative forest aerial interpretation. The results of tree height tests are published elsewhere [cf. following abstract]. The focal length accepted as standard by the U.S. Department of Agriculture is $8\frac{1}{4}$ in., which is well suited to photography at the scales generally preferred for forestry use (from 1 : 10,000 to 1 : 24,000). For mountainous country a 12-in. lens might be considered. Contact prints are generally used by foresters; enlargements are bulky to handle and difficult to examine stereoscopically. Vectographs (three-dimensional pictures in the form of a single print constructed from stereoscopic pairs by the application of the polaroid process) are of value in presenting forestry data to people not accustomed to the use of the stereoscope, though the prints show slight losses of resolution and tone differentiation. They would provide a compact and permanent three-dimensional picture which could be supplied to woods foreman, contractors, etc. The choice of scale depends largely upon the use to which the photographs are to be put. Photographs at 1 : 15,840 (4 in. to the mile) are almost universally applicable to forestry work. With them timber types can be carefully studied and individual trees measured. Practical scales may vary, however, from 1 : 10,000 to 1 : 24,000. For most forestry purposes the best combination of photographic materials is that of infra-red film with a light-coloured filter. This produces pictures with well resolved details and with marked differentiation in tone between the major timber types. The minus blue filter (No. 12) has proved very satisfactory for this purpose, but it is possible that a somewhat darker filter might prove preferable. Panchromatic film gave excellent results; tree heights and other details could be measured with ease, but the major forest types were not always easy to distinguish. Forest species cannot be positively identified and measured from air photographs unless the interpreter is familiar with the area being studied and has the opportunity of checking his results on the ground. Intensive study on the ground is very helpful in the interpretation of any area, and a knowledge of the ecological habits of the

species present will enable differentiations to be made which are not otherwise apparent.

The results obtained from the experimental photography discussed in this paper indicate that the usefulness of air photographs to the forester can be greatly increased by the choice of proper specifications, without greatly increasing the cost of the photographs or diminishing their usefulness for other purposes.

[2802]. 61.32 : 52.2. SPURR, S. H., and BROWN, C. T., JR. **Tree height measurements from aerial photographs.** *J. For.* 44 (10), 1946 (716–21).

The writers describe the basic principles of three methods of measuring heights of trees from aerial photographs: (1) measurement of shadows, (2) direct measurement of trees on the photographs, and (3) measurement of parallax differences on stereoscopic pairs of photographs. They conclude that method (1) is the easier to master but method (2) the more accurate and applicable to a wider range of conditions. The accuracy of tree-height measurements from aerial photographs depends upon the film emulsion used, scale of photography, focal length of lens, time of day of photography, method of measurement, skill of the observer, shape of the tree being measured, and character of the forest being studied. Using high-grade modern photographs of modified infra-red type, taken with a lens having a focal length of 8¼ in., the average observer should be able to classify forest stands accurately into 10-ft. height classes at a scale of 1 : 16,000 and into 5-ft. height classes at a scale of 1 : 12,000. A highly skilled interpreter can do better still. *From authors' summary.*

[2803]. 61.32 : 52.2 : 07.7. SPURR, S. H. **Parallax wedge measuring devices.** *Photogram. Engng.* 11 (2), 1945 (85–9). L.S.

The parallax wedges described consist of two diverging rows of dots, printed on a transparent material, which when fused stereoscopically and superimposed over a stereoscopic aerial view, appear as a single row of dots slanting downwards through the stereoscopic model. The height of a tree may be determined on a photograph by noting the difference in reading between the image dot that lies on the ground at the base of the tree and the image dot that is level with the top of the tree. The wedges are simple and inexpensive to construct and much easier to use than the conventional parallax bar. Readings obtained with the parallax wedge may be converted to actual elevation or height by the formula

$$ho = \frac{f \times P}{RF\,(W + P)} \text{ or } ho = \frac{H \times P}{W + P}$$

where ho is the height of the object, f is the focal length of the camera, P is the differential parallax, RF is the representative fraction or natural scale of the photograph, W is the photo distance between the centres of the stereo pair in line of flight, and H is the height of the camera above the ground (all distances converted to feet).

[2804]. 61.32 : 52.2 : 07.7. ROGERS, E. J. **Use of the parallax wedge in measuring tree heights on vertical aerial photographs.** *For. Surv. Note Ntheast. For. Exp. Sta.* No. 1, 1946. pp. 17.

Some hints are given on the use of the parallax wedge [see preceding abstract], to enable the forester to become more familiar with its application. Three methods are outlined for converting the parallax-wedge readings to tree heights in feet, with an estimate of the possible errors involved in each case. By Method I, initial tree heights can be estimated in about 5 minutes, including all steps; other tree heights may be estimated in a matter of a few seconds. Methods II and III require about half an hour, but they furnish the basic data which may be used over 1,000 to 15,000 acres or more.

[2805]. 61.32 : 52.46. GRUMBINE, A. A. **Aerial photo timber cruising.** *Sth. Lumberm.* 173 (2177), 1946 (220–2).

An account of methods and equipment in general terms, illustrated by two sets of sample stereo pairs with sketch maps, and classification by forest type, form, size and density classes derived from study of them.

[2806]. 61.4 : 07.7. GRANT, D. L. **Use of aircraft altimeters.** *J. For.* 45 (1), 1947 (50–1).

A new method of obtaining elevations for use in the preparation of contour maps has been developed by the Kosmos Timber Company, Washington. Instead of using the traditional Abney-level method, elevations were taken by direct readings from aircraft altimeters (surplus Government stock). The compassman noted the time of observation as well as the

elevation and later the field observations were corrected according to air-pressure changes noted on a control altimeter read every half hour by the field camp cook. It was found possible by this method to cover about 2½ times as much ground in a day with two men, as could be done by 3 men in the usual way, and results were at least as accurate. These aircraft-type altimeters are calibrated in 20-ft. intervals but may be accurately read to the nearest one or two ft. when set at a bench mark each day.

62. COMMUNICATIONS

[2807]. 62 : 07.7 (71) : 61.32. HAY-ROE, K. K. **The helicopter in woodlands operations.** *Woodl. Sect. Index Canad. Pulp. Pap. Ass.* No. 858 (F–3), 1946. pp. 2.

A paper read by a director of the Bell Aircraft Corporation. It is claimed that the Bell Model 47 2-passenger helicopter, now in production, can make a gentle landing in a woodland clearing just large enough to give all-round clearance to the rotors or, from the clearing, rise vertically to heights up to about 3,000 ft., or hover intermediately. It has a high speed of over 100 m.p.h., cruising speed 80 m.p.h., range of about 200 miles and a service ceiling of about 10,000 ft.

[2808]. 62 : 07.7. SWINTON, K. R. **Communication problems in the logging industry.** *Timber of Canada* 7 (1), 1946 (106–10).

Modern radio equipment, using frequency modulation, is now capable of providing reliable and economical two- or three-way communication between all points belonging to a logging system. Modern equipment is using the very-high-frequency (VHF) band, extending from 30 to 162 megacycles, which ensures a virtually noise-free and interference-free service. The direct range of these frequencies is normally limited to 'line of sight', but communication over long distances, even when separated by a mountain range, can be obtained by automatic relay stations, directional antennae, or suitable location of both stations. The equipment will operate from either 100-volt A.C. or 6-volt D.C. When no commercial power is available, the equipment can be operated from an A.C. generator or a 6-volt storage battery driven by a small petrol engine. Sometimes the use of wind chargers may be advantageous and economical. A table shows the relative advantages of land line, medium-frequency radio, and very-high-frequency radio for logging communications.

[2809]. 62 (71) : 07.7. KINGAN, J. J. **The uses of radiotelephone in woods operations.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 862 (B–5), 1946. pp. 3.

Descriptive notes on some of Marconi's latest types of forestry radiotelephone equipment, both frequency-modulated and amplitude-modulated. It is estimated that the cost of 6 miles of line construction will pay for equivalent radio installations, and that for longer distances radio is cheaper than line construction. There are many localities where distance and topography are such as to render the use of FM equipment expensive; in such cases AM equipment meets the requirements. When the use of radiotelephone is contemplated, advice should be taken from a reliable radio company, experienced in such work.

[2810]. 62 (71) : 07.7. FISHER, W. C. **FM radio—and its applications to woods operations.** *Pulp Paper Mag. Can.* 47 (11), 1946 (109–13).

Notes on different types of frequency-modulated radiotelephony: Simplex two-way FM radio communication between two or more fixed stations; Duplex two-way FM radio communication between two or more fixed stations; two-way FM radio communication between a fixed station and a mobile station. When the distance to be covered is less than 10 miles, FM radio becomes more expensive than land line and then installation is warranted only by the desire for greater reliability, flexibility, quality, etc., than is possible with other systems of communication.

64. DESCRIPTION OF SITE. ASSESSMENT OF SITE AND STAND QUALITY

[2811]. 64 : 52.2 : 55 : 12.26–8 : 01.7. RAGHAVAN, M. S. **Constants connecting top heights and age for different site qualities in Teak plantations.** *Indian For.* 72 (10), 1946 (460–1).

65. DESCRIPTION OF GROWING STOCK

[2812]. 65. WILSON, F. G. **Numerical expression of stocking in terms of height.** *J. For.* 44 (10), 1946 (758–61).

Having previously [cf. *For. Abstr.* 7 (No. 1004)] advocated the use of height to define maturity as a basis for legal control of cutting in young stands, the author now develops the use of height as a factor in the measurement and regulation of growing stock. An equation is offered, which may prove to have value in defining upper and lower limits to normal stocking. For uniformly stocked, even-aged stands of any species we may write $n = \frac{43{,}560}{(hf)^2}$ where n is the number of trees per acre, h is the height of the stand, and f is a certain fraction of height appropriate to the species. In logarithmic form, this is the equation of a straight line provided that f is constant. The lines for different values of f are parallel and their slope is defined by the equation $2 \log h = -\log n$. That is to say, if f is constant, the equation means that the ratio of the number of trees to the square of the average dominant height is the same for all ages and on all sites. Whether this reflects a law of normal stocking for closed stands can be determined only by experiment.

Tables are given showing values of f (deduced from yield tables) for Jack Pine, Aspen, Red Pine, Black Spruce and Red Oak. The apparent conclusions from these data are that:—

(1) The factor f decreases with tolerance.

(2) Site has no effect on f.

(3) The factor f increases where suppressed trees are excluded from consideration.

(4) The factor f varies with the natural ability of species to thin out with age.

66. POSSIBILITY. SUSTAINED YIELD. YIELD REGULATION

[2813]. 66 : 12.26–8 : 63 : 57 : 12.19.4 (92). STEUP, F. K. M. Boschbeheer in de vloedbosschen van Riouw. **[Management of the Mangrove forests of the Rhio Archipelago.]** *Tectona* 36 (5), 1946 (289–98). [Du.e.]

Steup regards Danhof's figures for Mangrove increment in this region [see *For. Abstr.* 8 (No. 2176)] as overcautious, estimating that with a 15-year rotation the annual increment per ha. is well over 5 cu.m. Assuming this figure, 45 ha. would normally be a sufficient cutting area for one charcoal kiln, and as the average is now 90 ha. per kiln, the number of kilns could be doubled if the whole area were normal. The chief areas where Mangrove yields would be lower are probably those in which any considerable quantity of Njirih (*Carapa granatum*) exists. The roots of this species tend to promote silting-up and thus to raise the soil level, and its dense crown appears to prevent regeneration of the Rhizophoraceae. Encouragement of the cutting of Njirih for firewood has been tried in some places, but it is feared that this will not retard the natural succession towards dry-land forest.

The Mangrove forests are scattered over hundreds of islands and a general working plan is not possible; yield regulation must therefore be achieved by the introduction of simple cutting series for each panglong or natural group of panglongs, and the panglong areas must be adjusted to the natural blocks of Mangrove forest. As sudden introduction of this plan would be impracticable it is suggested that, for a transition period, 'stick' thinnings, using a stick of about 1 m. in length, should be made in the younger stands.

[2814]. 66 : 65 : 57 : 01.7. MEYER, W. H. **Predicting the effect of the heaviness of the cut on growing stock.** *J. For.* 44 (12), 1946 (1092–4). [Yale School of Forestry.]

The writer described some years ago [cf. *For. Abstr.* 5 (287)] the application of an amortization formula to problems of stand growth and depletion. He has now modified the formula so as to be more applicable to selection forests, where cutting may be carried on throughout the year, by including the factor of growth during the year. The final formula, the derivation and application of which are described, is

$$V_n = V_o\,(1+g_1)^n - \frac{2\,C\,(1+g)}{g_1\,(2+g_2)}\,[(1+g_1)^n - 1]$$

where V_o is the total stand volume at the beginning of the period of regulation; V_n is the volume remaining at the end of n years, with cut deducted and growth added; C is the annual cut; g_1 is the growth rate (in per cent. expressed as a decimal) of the stand as a whole; g_2 is the growth rate of the merchantable trees from

which the cut is removed; and *n* is the number of years in the prediction period.

[2815]. 66 : 65 : 57 : 56. LIHTONEN, V. Tutkimuksia metsän puuston muodostumisesta. Tuottohakkauslaskelma. **[Studies on the development of forest growing stock. Calculation of the annual yield.]** *Acta forestalia fennica* 51 (2), (1943) 1946. pp. 235. [Fi.g.]

A detailed theoretical study, the aim of which is to demonstrate, with the aid of Finnish data, the principles of annual-yield calculations under modern silvicultural conditions. After a general consideration of the basic factors of, and the relations of management and silviculture in connexion with the yield calculations, separate chapters are devoted to detailed examination of: (1) increment, with special attention to the need for distinguishing that portion of the stocking, plus its increment, which will be removed during a given management period (*Abgangsvorrat* and *Zuwachs des Abganges*), from the growing stock and its increment that will be carried over into the next period (*Ertragsvorrat* and *Vergleichszuwachs*), and to the influence of intermediate and regeneration fellings on increment; (ii) *Abgang* (depletion by fellings and/or natural thinning) and its analysis from the points of view of silviculture and management; (iii) the synthesis of (i) and (ii) in the calculation of the annual yield, illustrated by an example based on data for the province of Aland. There is a 20-page Germany summary.

67. WORKING PLANS

[2816]. 67 : 60.31.2. MCNEILL, W. M. **Private forestry. The working plan.** *Scot. For. J.* 60 (1), 1946 (7–25).

An explanation of the method and purpose of constructing working plans, illustrated by an actual working plan for the woodlands of an Aberdeenshire estate. The paper is designed for the instruction of private owners who are considering the dedication of their woodlands.

7. FOREST ECONOMICS, VALUATION, AND FINANCE

[2817]. 7 : 02.1 : 6 (43). DIETERICH, V. Forstliche Betriebswirtschaftslehre: Bd. I. Die wissenschaftliche Grundlegung. **[Theory of the economics of forest management: Vol. I. The scientific basis.]** Verlag von Paul Parey, Berlin. 2nd (revised) ed., 1943. pp. 433. [G.] [Univ. of Munich.]

The first edition of this work was reviewed in *For. Abstr.* 1 (205). No occasion has been found for any major alteration, and the present edition differs only in having been brought up to date in some details and revised as to style, and in the addition of a short section, under Costs, on Interest on Debts, Apanages and Landlord's Liabilities.

76. MANAGEMENT STATISTICS

[2818]. 76 (76) : 60.31.2. BOND, W. E. **Forestry pays on the farm.** *Sth. Lumberme* 173 (2177), 1946 (127–30).

The writer analyses costs and returns from the practice of forestry on several farms in the Southern United States and shows that it is a profitable enterprise, especially if the farmer cuts and delivers the timber instead of selling it on the stump.

78. CALCULATION OF PRESENT AND FUTURE VALUES

[2819]. 78 : 57 :76 : 63 : 2 : 12.25 : 56 : 11.47.13. MACKENZIE, J. M. D. **Some financial speculations.** *Scot. For. J.* 60 (1), 1946 (29–37).

The urgent need to increase the available volume of timber makes it necessary to consider any measures which will increase the annual increment per unit of area, either by shortening the rotation required to produce a given volume or by increasing the volume produced in a given rotation. Measures such as pruning, insect control, manuring, cultivation in youth, may contribute to this end either singly or in conjunction. As an example of reduction in period of rotation, the writer cites an experiment in manuring 6-year-old Larch with Kainit; when the trees were 15 years old and were thinned, it was found that the rings for the 6th to 10th years were very much wider

than those before and after, and the trees were about 5 ft. taller than those which were unmanured. Assuming that this lead is maintained through the rotation of 80 years, he estimates that treated trees would reach the same volume in 77 years as untreated ones in 80 years, and calculates the additional profit as being 3 per cent. simple interest for 3 years on the money return from the final yield; if this sum is discounted back to the year in which treatment is given, the resulting amount is that which can then be spent on treatment without ultimate loss. This seems to be as good a method of calculation as any, when the improvement can be reckoned in terms of a reduction of the rotation. Where the improvement is in quality or volume of timber on the same rotation, a different method of calculation is necessary. Probably the most correct way would be to work out the gain due to each measure separately, reduce it to cash, and then find out the present value of the sum in the year when the measure was initiated. For bird management this is probably about year 20, for manuring years 6–10, for pruning years 12–18. In an appendix, sample figures are given for net profit (and its present value at year 20) by reducing rotation from 80 to 76 years, and by a 10-per-cent. increase in yield on an 80-year rotation and shorter rotations, for Scots Pine, Norway Spruce and European Larch.

The writer urges that more should be done to increase the yield on the better sites instead of concentrating efforts on growing timber on poor sites. The increase in yield of a heavy cropper such as Douglas Fir or Sitka Spruce of high quality, given by a 20-per-cent. improvement, may exceed the total yield of low-quality Larch or Scots Pine in value and even in volume if thinnings are taken into account.

8. FOREST ADMINISTRATION

81. ORGANIZATION. REGULATION OF SERVICE

[2820]. 81 (59.6–9). WORMSER, G. La réforme des Services de l'agriculture, des forêts et de l'élevage en Indochine. **[Reforming the Service of Agriculture, Forests and Animal Husbandry in Indo-China.]** *Rev. int. Bot. appl.* 26 (285/286), 1946 (286–95). [F.] P.R.

[2821]. 81 (73). CHAPMAN, H. H. **Does the 'profession' of forestry need a code of ethics?** *J. For.* 45 (1), 1947 (61–6).

The Engineers' Council for Professional Development in the United States has for some years been working for the adoption of an identical code of professional conduct for all engineering societies. The writer of this article believes that the adoption of such a code by foresters is overdue, and thinks that this proposed code, with possible modifications, would be suitable. The E.C.P.D. code is printed in full.

82. LABOUR QUESTIONS

[2822]. 82 (44). BERNARD, P. Libres points de vue: quelques problèmes de main-d'œuvre dans l'industrie du bois. **[Free commentary: some labour problems in the wood industry.]** *Rev. Bois Appl.* 1 (4), 1946 (32–3). [F.] P.R.

[2823]. 82 (71). GIBSON, D. L. **The nutrition of forest workers.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 861 (B–2), 1946. pp. 3.

A résumé of a report based on a fairly extensive survey of Canadian logging camps. It was found that most companies provided sufficient food of good quality, but that it was often spoiled by poor storage conditions and bad cooking. The establishment of a permanent cookery school under Government supervision is now being considered. It was found that the men leave much more frequently in camps where there is a poor cook. It is recommended that forest workers should have about 5,800 calories per day, + 5 per cent. in cold weather and −10 per cent. in warm weather.

[2824]. 82 (71). GIBSON, D. L. **Feeding in logging camps. A survey of nutrition of woods workers in the camps of member companies of the Woodlands Section, Canadian Pulp and Paper Association.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 873 (B–2), 1946. pp. vii + 53.

The survey here reported on was made in a number of camps in Ontario, Quebec, New Brunswick and Newfoundland. The report

gives details of the study and makes recommendations for improving the feeding of men in logging camps.

[2825]. 82 : 32.25 : 07.7 (43.1–5 : 47.1 : 494: 485). Fragen der Waldarbeit—Vorträge, gehalten am 13 Mai 1943 zu Eberswalde anlässlich der VII. Komiteesitzung der Internationalen Forstzentrale. **[Forest labour problems.—Lectures delivered on 13 May 1943 at Eberswalde at the 7th session of the Committee of the Centre International de Sylviculture.]** *Silvae Orbis* No. 13, 1943. pp. 75. [G.]

The lectures here reproduced are: (i) *H. H. Hilf's* general discussion of the development of new or improved working methods and their introduction into practice, based on experience as the head of the Institut für forstliche Arbeitswissenschaft, Eberswalde. (ii) *P. Aro* on the principles of the maintenance of forest saws. (iii) *J. Zehnder* on vocational training of woodcutters in Switzerland. (iv) *B. Flodman* on the rationalization of forest work in Sweden, with an appendix by *C. G. Sundberg* containing a basic performance table and correction tables for various factors increasing the difficulty of work, for fuelwood felling and cutting, as used in Sweden for assessing piece-rates, etc. (v) *P. Aro* on emergency arrangements for wood supply in Finland (voluntary cutting, cutting competitions, etc.).

9. FOREST POLICY

[2826]. 9 : 06.2. **The Copenhagen Conference [of the Food and Agriculture Organization of the United Nations]: summary of principal actions.** *Inform. Serv. Bull. FAO* 1 (6), 1946. pp. 12.

90. GENERAL PRINCIPLES OF FOREST POLICY

[2827]. 90 (45). BROWN, N. C. **A long-range program for Italian forestry.** *J. For.* 44 (12), 1946 (1058–62). [New York State College of Forestry, Syracuse, N.Y.]

The writer was sent to Italy, early in the allied occupation, to advise the Allied Commission on a forestry programme. The present article is a summary of his report. The recommendations include one that the Italian government should follow a definite programme to acquire and manage about 20 per cent. of the total forest area of the country. At the present time, 66 per cent. of the forests are in private ownership, 31 per cent. belong to communities or public institutions, and 3 per cent. are State forests. The total forest area is about 6 million ha. or 20 per cent. of the total land surface of the country. About 80 per cent. is deciduous and 20 per cent. coniferous forest. According to the most recent figures, the annual growth is about 15 million cu.m., of which it is estimated that 80 per cent. is converted to firewood and charcoal, and 20 per cent. to construction and pulp. Although the present production of firewood and charcoal is approximately sufficient for domestic requirements, it could well be increased to keep down prices for those commodities and provide for a growing population and expanding industry. The amount of constructional timber and pulpwood should be greatly expanded so as to reduce the relatively large amount of wood imported. The area of timber-producing land could well be increased, particularly in the mountain regions where there are large areas that are unsuitable or marginal for other crops and uses.

[2828]. 90 (54.3). MATHUR, V. P. **A note on forest policy, with special reference to West Berar Division (1894-1944).** *Indian For.* 72 (12), 1946 (563–9).

A discussion of the objects of forest policy in West Berar Division as laid down in 1894, and of how this policy has been applied or disregarded, with particular reference to the management of (1) protection forests, (2) timber forests, (3) minor forests to supply local needs and (4) pasture and grazing grounds.

[2829]. 90 (68.9). NORTHERN RHODESIA. **Department of Agriculture: annual report for the year 1945.** Govt. Printer, Lusaka. 1946. pp. 28.

The general condition of forestry in the Territory is reviewed and the duties of the

forest service are outlined. These duties are taken to be the protection of streams and escarpments, the fire protection of special types of woodland and of 'resting' agricultural savanna, the establishment of communal forests for sawtimber, and the maintenance of supplies of special woods and minor forest products (pp. 13–14).

[2830]. 90 (71.1) : 09.7. SLOAN, G. MCG. **Report of the Commissioner, the Honourable Gordon McG. Sloan, Chief Justice of British Columbia, relating to the forest resources of British Columbia.** King's Printer, Victoria, B.C. 1945. pp. 195 + plates + maps + charts.

The recommendations made in this report are, in order of urgency: (1) increased fire protection, (2) increased rate of planting cut-over lands, especially on the Coast, (3) regulation of logging methods to prevent destructive exploitation and ensure regeneration, (4) formulation of new systems of tenure and taxation to encourage private forestry and remove causes compelling liquidation, (5) management plans for individual regional working circles, (6) creation of a commission with full responsibility for all forestry management during the conversion period, (7) a long-term programme of forestry education, (8) intensified research in and practice of silvicultural methods, (9) provision of adequate funds for research.

[2831]. 90 (73) : 07.1 : 07.2 : 09.7. UNITED STATES. **Problems and progress of forestry in the United States. Report of the joint committee of forestry of the National Research Council and the Society of American Foresters.** Society of American Foresters, 825 Mills Building, Washington, D.C. 1947. pp. v + 112. Price $1.75.

The joint committee was set up in 1942 in order to study the present forest situation in the United States, to review what is being done in various fields of forestry, and to determine and interpret problems that are not already being studied by existing agencies. The report is made up as follows: Part I reviews the present state of forests, forestry and wood utilization in the United States; Part II, public responsibilities and action in forestry; Part III, problems of private forestry; Part IV, public action in advancing private forestry; Part V, education and research in forestry. Special emphasis is directed to the urgent need for further research into the specific characteristics and properties of second-growth wood of various species and to the need for modification of existing utilization practices in order to use low-grade wood more effectively. The committee urges that silvicultural research should further stress the importance of information on quality of wood produced under different growth conditions, with special emphasis on the significance of production of timber suited to industrial use. It is also recommended that the extent of overgrazing of forest and open range lands in National Forests should be determined by a special outside commission of experts. The Joint Committee strongly recommends that in the event of further organization of federal departments and bureaux, the Forest Service should be retained in the Department of Agriculture. It is recommended that federal and state support be provided on a larger scale than at present to reduce the fire hazard to a point where it will not discourage private owners from adopting constructive measures of forestry. In view of the inevitably slow progress in enactment of uniform legislation regulating cuttings on private lands in the large number of states in which forests are important, the committee recommend that Congress provide authority for federal regulation of private forests, adequately supported by funds for administration of the law.

[2832]. 90 (79.4) : 09.7. **The forest situation in California.** Report to the Legislature by California Forestry Study Committee, created by Chapter 1086, Statutes of 1943. 1945. pp. 189.

The Commission found that the forest situation in California, with 5 million acres of the best forest land cut-over or burned, most of the cut-over land not regenerating adequately, losses from insect pests exceeding those from fire, a burdensome system of taxation and the highest *per capita* lumber consumption in the United States, is of the utmost gravity. Although further research is needed, the Commission urged immediate action, owing to the gravity of the situation. They recommended legislation: (1) to set up machinery to establish and enforce sound cutting and protection practices in privately owned forest; (2) for the

acquisition of forest land for demonstration areas and State forests; (3) to secure State co-operation in forest-insect control.

91. SOCIAL AND ECONOMIC INFLUENCE OF THE FOREST. NATIONAL PARKS. RESERVES. FOREST INFLUENCES

91.1. *Rural Preservation. Reserves. National Parks. Plant and Animal Protection*

[2833]. 91.1 (494) : 06.2. BÜTTIKOFER, J. Rapport sur la Conférence pour la Protection Internationale de la Nature (Bâle, 30 juin au 7 juillet 1946). **[Report on the Conference for the International Protection of Nature (Basle, June 30th–July 7th, 1946).]** The Swiss League for the Protection of Nature, Basle. 1946. pp. 109 + plates. [F.E.]

[2834]. 91.1 (69). HUMBERT, H. La protection de la nature à Madagascar. **[Nature protection in Madagascar.]** *J. Arnold Arbor.* 27 (4), 1946 (470–9 + plates). [F.] [Muséum Nationale d'Histoire Naturelle, Paris.]

Discusses briefly the floristic composition of the chief vegetational zones of the island, the destruction of forest by bush fires, and the creation of 11 reserves to conserve types of the native vegetation.

[2835]. 91.1 : 91.2. IMMEL, R. La protection de la nature et l'idée du paysage dans la sylviculture. **[Nature protection and the conservation of the landscape in forestry.]** *Intersylva* 2 (3), 1942 (340–59). [F.g.e.it.span.]

The increasing tendency of modern silviculture towards the promotion of uneven-aged selection forest is in accord with the needs of landscape conservation. The forester should give particular attention to the preservation and systematic planting of individual trees. The treatment of forest roads, rides and edges particularly calls for skill and taste.

91.4. *Value of the Forest in Hygiene and Recreation*

[2836]. 91.4. SIEKER, J. **Aircraft and forest recreation.** *J. For.* 44 (11), 1946 (888–92). [U.S. Forest Service, Washington, D.C.]

Speculations on the possible effects of a great expansion of flying on wild-life management and the recreational value of National Forests.

[2837]. 91.4 (73). WOLFF, M. H. **Some aspects of the legal and economic provisions governing forest recreation.** *J. For.* 44 (11), 1946 (892–6). [U.S. Forest Service, Missoula, Mont.]

92. FOREST LAW

[2838]. 92 (410). GREAT BRITAIN. **Town and Country Planning Bill.** pp. vii + 131. (Bill 26.) **Explanatory memorandum.** pp. 22. *Cmd.* 7006. H.M. Stationery Office, London. 1947.

[2839]. 92 (410) : 32.25.1 : 32.25.2. FENNELL, W. **Tree lopping for overhead lines.** *J. Land Agents' Soc.* 45 (11), 1946 (248–51).

A review of the rights and responsibilities of owners and occupiers of land on the one hand and electricity undertakings on the other, as laid down in the Electricity (Supply) Acts of 1919 and 1926, in the matter of felling or lopping trees which interfere with overhead power lines. Suggestions are made for promoting amicable agreements and avoiding litigation.

[2840]. 92 (43.1–5). EBERTS, H. La législation forestière allemande. **[German forestry legislation.]** *Intersylva* 2 (2), 1942 (172–241). [F.g.e.it.span.]

After a short account of the general principles of German forestry legislation before 1933, the writer gives a detailed account of forestry legislation after that date, including legislation to regulate the timber trade. The last part of the article consists of an account of a proposed new Reich Forestry Law, codifying previous laws, with an estimate of its probable effects.

[2841]. 92 (54.1). HOWARD, SIR H. **The Bengal Private Forests Act (Act XI of 1945).** *Emp. For. Rev.* 25 (2), 1946 (222–4).

An analysis of the objectives and provisions of the Act. The object of the Act is stated to be 'to provide for the conservation of private forests and for the afforestation in certain cases of waste lands in Bengal'. The net effect is that even within a notified area any private forest properly managed will be left to the management of the owners, provided that a

working plan is prepared and approved by the Regional Forest Officer. Management of private forests will only be taken over by Government: (*a*) as a penalty for violating the working plan; (*b*) when Government is satisfied that the owner cannot manage the forest (usually when there are a number of very small owners); (*c*) where waste land is suitable for afforestation and the owner is unwilling either to cultivate it or afforest it. The necessary sections of the Indian Forest Act have been repealed and included in this Act.

[2842]. 92 (67.5) : 97. HEYSE, TH. Le régime des cessions et concessions de terres agricoles et forestières au Congo belge. **[Rules relating to transfers and concessions of agricultural and forest lands in the Belgian Congo.]** *Bull. agric. Congo belge* 37 (3), 1946 (483–553). [F.]

[2843]. 92 (728.2). **Progress in tropical forest legislation.** *Carib. For.* 7 (4), 1946 (275–283). [E.Span.]

Consists of (1) An Ordinance to provide for the conservation of the private forests of the colony, enacted by the Governor of Honduras; (2) the programme of forestry approved by a conference of all public agencies engaged in land planning in the mountain area of Puerto Rico.

[2844]. 92 (73) : 94.3. DAVIS, K. P. **Development of forest practice controls in the United States.** *J. For.* 44 (11), 1946 (934–9). [School of Forestry, Montana State Univ., Missoula, Mont.]

Traces the development of forest practice rules in the United States, outlines their present status, and discusses some of the difficulties in the way of their formulation and application.

95. FOREST TAXATION, LOANS AND INSURANCE

[2845]. 95.1. GILMOUR, J. D. **Taxation principles for sustained yield forest management.** *Woodl. Sect. Index Canad. Pulp Paper Ass.* 876 (A–1), 1947. pp. 4.

The writer discusses the history of taxation of agricultural land and of forests in Canada and urges the necessity of revising the basis of forest taxation now that the virgin forests are almost exhausted. Forest management for maximum production would be most encouraged under the following principles of taxation:—(1) Taxes to be assessed and paid on land and not on crop, as has always been done for agricultural land. (2) Taxes to be assessed and levied annually. (3) Assessments to be based roughly on site quality, that is, the relative productive capacity of the land. (4) Taxes to be deferrable at the option of the owner, such deferred taxes to bear interest at the current government rate and the interest to be compounded annually. (5) The amount of deferred taxes and accrued interest to be limited to some conservative percentage of the total property value. (6) A credit to be allowed to the owner for all taxes and accumulated interest on lands where the crop is lost by fire or otherwise.

[2846]. 95.3. KÖSTLER, J. Das forstliche Kreditwesen. **[Forestry credit.]** *Silvae Orbis* No. 10, 1943. pp. 80. [G.g.]

A preliminary digest of material from a number of countries, gathered in pursuance of a resolution at the second International Forestry Congress, Budapest, 1936, by the International Institute of Agriculture and later by the Centre International de Sylviculture. The chapter headings are: Peculiarities of forestry credit; significance of various types of credit; substitute arrangements; special laws on forestry credit; future tasks in connexion with credit in forestry.

The material collected was heterogeneous and incomplete, so that no complete review of actually existing mortgage conditions was possible, though there were some indications that certain types of forestry credit are probably worth encouraging in future. The best conditions for the development of forestry credit are afforded by a forest policy directed towards sustained yield, together with the creation of forestry enterprises that are soundly managed as businesses.

[2847]. 95.3 (47.1) : 95.2. ARO, P. Die Waldkreditfrage in Finnland. **[The question of forest credit in Finland.]** *Intersylva* 4 (1), 1944 (32–43). [G.g.e.span.f.it.]

A report to the Centre International de Sylviculture. After discussion for many years, forest credits were first allowed in 1917 by the Finnish Mortgage Union. Other interested financial bodies were hampered both by lack of

capital and by inability to obtain sufficient guarantees to secure the loans. In 1930, however, a Forest Mortgage Act came into force: this permits forests to be taken as security for loans and to be mortgaged together with the estate as security for liabilities, provided that the borrower undertakes to limit exploitation of his forest or to follow a working plan laid down in writing. To safeguard the owner from over-dependence upon the lenders, the right to issue forest mortgages is restricted to credit institutions under public control and to co-operative societies' banks. Felled stands or converted timber are not taken as security. Experience in taking growing stock as security and of the results of the Act is scanty as yet, but good results are expected.

96. POLICY REGARDING AFFORESTATION

[2848]. 96.5 (94) : 12.25 : 98 : 35 : 09.7. RODGER, G. J. **Softwoods in Australian forestry.** *Aust. Timb. J.* 12 (8), 1946 (440, 443–4, 447, 449, 451, 453–5, 457, 459).

The paper deals first with Australia's softwood requirements. Consumption of timber in 1938 was 85 million cu. ft., of which about half was softwood. It is calculated that in 50 years' time the corresponding figures will be 144 million cu. ft., of which half will be softwoods. The overseas sources of softwoods are reviewed and the need for Australia to supply her own need is deduced. Some account is given of native softwoods, notably Cypress Pines (*Callitris* spp.), Bunya and Hoop Pines (*Araucaria* spp.), Kauri Pine (*Agathis robusta*), and the Tasmanian Pines (*Athrotaxis selaginoides*, *Dacrydium franklinii*, *Phyllocladus rhomboidalis*). Small quantities of all these species are still being obtained, the sawn output being about 1½ million super. ft. per annum. They all provide very high quality timber, but grow slowly and their regeneration on a commercial scale is regarded as economically impossible.

Plantations of softwoods amount to about 278,000 acres, of which over 190,000 are Radiata Pine. The yield from these plantations is already over 5½ million cu. ft. per annum. The various State Forest Services propose to plant a total of 800,000 acres, at a rate of 30,000 acres per year to be attained within the next 5 years. The writer suggests that, in order to produce the amount of timber needed, 1 million acres is probably necessary.

97. POLICY REGARDING THE RELATION OF THE FOREST TO AGRICULTURE, PASTURE, AND INDUSTRY

See also *For. Abstr.* 8 (Nos. 2838, 2842).

[2849]. 97 (66.9) : 34.26. FORDE, D., and SCOTT, R. **The native economies of Nigeria.** Edited by M. Perham. Published under the auspices of Nuffield College by Faber and Faber Limited, 24 Russell Square, London. 1946. pp. xxiv + 312 + maps. Price £1 . 5*s*. 0*d*.

[2850]. 97.1. GRAHAM, E. H. **Natural principles of land use.** Oxford University Press, New York, Inc. 1944. pp. xiii + 274. Price $3.50.

This book is composed on the premise that biological concepts can contribute importantly to the wise use and management of land; it treats significant natural phenomena so that they provide guiding rules of thumb for the land manager.

A general ecological survey discusses the distribution of plant and animal communities, plant succession and indicators, food-chains, range and territory, cycles, methods of studying populations and classifying land, etc. Land use is dealt with in sections on farms, forests, grazing, wild life, waters and human welfare. The illustrations, all photographs, contain a large number of 'before-and-after' examples. In discussing forests, reference is made to shifting cultivation (here called bush fallowing) in New Guinea, Tanganyika and Guatemala, old-field succession in New England and the Northwest, the effect of game and grazing, of rodents and mammal-insect relationships in U.S.A. Some features of the introduction of exotics are illustrated by the Lantana—bird—armyworm cycle in Hawaii, the suitability of strains of Douglas Fir for Europe, the biological control of prickly pear, and the use of climographs as indices of regional suitability.

[2851]. 97.1 (59.6–9) : 91.5. Les bois et ses produits à travers le monde: l'Indochine. **[Forests and forest products throughout the world: Indo-China.]** *Rev. int. Bois* 13 (114), 1946 (213–4). [F.]

The natives of the mountainous parts of French Indo-China practice shifting cultivation (ray) on a large scale and have destroyed thousands of hectares of forest in the process. The cleared land is usually cultivated only for

one or two seasons and then reverts to short, thick grass. Attempts to regulate the practice have failed. The forest service is now trying a method which has been successful in Java, the establishment of village colonies. The ground is carefully drained, huts for coolies built, and wells sunk. Each colonist is allotted a piece of ground to cultivate, the profits from which belong to him. At the same time young trees are planted, at such intervals as will not interfere with agriculture; these profit from the cultivation of the soil and in due course provide a new forest.

[2852]. 97.1 (66.2) : 43. VIGUIER, P. Les techniques de l'agriculture soudanaise et les feux de brousse. [**Technique of Sudanese agriculture and bush fires.**] *Rev. int. Bot. appl.* 26 (279/280), 1946 (42–51). [F.] P.R.

Deals with native methods of soil exploitation and their consequences, and the problem of deforestation and bush fires, which includes sub-sections on (*a*) the effects of deforestation; (*b*) the causes of bush fires; (*c*) methods of control; and (*d*) deforestation caused by the browsing of goats.

[2853]. 97.1 (91.4) : 09.7 : 3 : 98.1. LAMBERT, W. H. **A forester's observations in Mindoro.** *J. For.* 45 (1), 1947 (40–4).

The writer gives some account of the present timber resources, timber trade and sawmilling industry in the island of Mindoro in the Philippines. The greatest obstacle to good forestry is shifting cultivation. The 'caingins' or clearings in the rain forest, which are made by burning, are quickly invaded by coarse grasses (*Imperata cylindrica I. exaltata, Saccharum spontaneum*) and abandoned after a few seasons. The thick mat of grass stifles tree regeneration and the frequent fires kill what few seedlings have managed to survive. The bad effects are increased by the fact that 'caingins' are frequently made on steep slopes and lead to serious erosion. The first requisite to bringing the forest lands back to full productivity is to equip the natives with at least common garden tools and train them in simple agricultural methods.

[2854]. 97.1 (97). **Forestry and land planning.** *Emp. For. Rev.* 25 (2), 1946 (165–8).

A summary of a discussion at the afternoon meeting of the Empire Forestry Association held on October 8th, 1946. The present position in India, Australia, the Colonial Empire, and Great Britain was described by various speakers. In the general discussion that followed, the following points were made:– Land planning should be based on a thorough understanding of soil science and ecology. At present there are not enough trained men in these sciences, and it was suggested that the Universities ought to assist in this matter by placing greater stress on education in these subjects. There is some confusion between policy and legislation. Forest Acts give the power to carry out the policy. There are few, if any, authorities which have laid down a policy on the lines of that of the Government of India. The importance of laying down a forest policy which can guide subsequent governments, and of team work covering all interests concerned with the land, was emphasized.

[2855]. 97.1 : 11.62.11. WRENCH, G. T. **Reconstruction by way of the soil.** Faber and Faber Ltd., 24 Russell Square, London. 1946. pp. 262. Price 12*s.* 6*d.*

The general theme and purport of this book is the priority of the soil, which forms the initial factor of life cycles in a sane and sound civilization. Of interest to foresters are the discussions on the effect of the nomads as makers of deserts in Central Asia, Syria, Arabia and the Sahara; the destruction of forests during the civilization of Rome and Asia Minor; shifting cultivation in Kenya, Nyasaland and the West Indies; the salvation of Tanganyika by the tsetse fly (a blessing in disguise); a thousand years of forest destruction in Russia; and the formation of semi-deserts in South Africa, Australia and the United States.

[2856]. 97.3 (494). KUSTER, A. Die Waldwirtschaft in ihren Beziehungen zur bergbäuerlichen Landwirtschaft. [**Forestry in relation to peasant agriculture in the mountains [of Switzerland].**] *Schweiz. Z. Forstw.* 97 (12), 1946 (541–8). [G.f.]

With reference to the need for improvement and regulation of pasturage and forests under communal ownership, construction of access roads, timber price policy and the construction of protective works.

[2857]. 97.4 (66.7) : 46 : 35.5. LOGAN, W. E. M. **Some effects of mining on the forest of Tarkwa district.** *Farm and Forest* 7 (1), 1946 (45–50).

The principal effects of mining on the forest vegetation in this area of the Gold Coast are discussed in some detail. The sum effect is mainly one of destruction, but the individual processes involved differ and may be divided into three categories: (1) clearing to enable mining operations to take place, (2) exploitation for the supply of mining timber, (3) clearing for agriculture in order to feed the labour in the mines.

The first type of clearing is not very extensive, the second entails cutting over about 5 sq. miles annually, which would normally result in adequate regrowth. In fact, the cut-over land is usually turned into farm land, which is cultivated more or less continuously and inevitably becomes degraded. It is concluded that the existing forest reserves, if properly managed and supplemented by plantations, should meet the demands of the mines for timber. The degradation of farm land must be met by improved agricultural conditions.

FORESTRY THE WORLD OVER

References: 1. *Action forestière et piscicole*, Paris. 2. *Australian Timber Journal*, Sydney. 3. *Biologia*, Washington. 4. *Bois congolais*, Brussels. 5. *British Columbia Lumberman*, Vancouver, B.C. 6. *Bulletin Hungarian Timber Research Institute*, Budapest. 7. *Crown Colonist*, London. 8. *Empire Forestry Review*, London. 9. *Foreign Commerce Weekly*, Washington. 10. *Italia forestale e montana*, Florence. 11. *Maderil*, Buenos Aires. 12. *Nature*, London. 13. *Paper Industry*, Chicago. 14. *Revue de Botanique appliquée*, Paris. 15. *Revue internationale du Bois*, Paris. 16. *Skogen*, Stockholm. 17. *Technical Notes Forestry Commission (Div. of Wood Technology) N.S.W.*, Sydney. 18. *Timber News*, London. 19. *Timber of Canada*, Ottawa. 20. *Timber Trade Journal*, London. 21. *Timberman*, Portland, Ore. 22. *Trees*, Cleveland, Ohio. 23. *Wood*, London. The numbers in brackets indicate the reference number and the date of publication of the periodicals, etc., to which the annotations refer.

Conferences. The 8th International Congress of Entomology is planned to meet at Stockholm, August, 1948; the exact date will be fixed later, so as not to clash with that of the Zoological and Genetical Congresses which will be held at about the same time.

A 'First International Plant Protection Congress' was held at the Agricultural Institute, Louvain, Belgium, September 15 29, 1946. Most of the papers dealt with phytopathology and economic entomology. A report will be published.

The 7th International Botanical Congress will be held in Stockholm on July, 1950. H. Osvald, Col. of Agriculture, Uppsala, is secretary (**3**; Feb. 1947).

The International Association of Microbiologists is organizing the Fourth International Congress for Microbiology to be held at Copenhagen during 20-26 July, 1947. The honorary general secretary is Dr. M. Bjørneboe, Kommunehospitalet, Copenhagen (**12**; 26.4.47).

Argentina. Owing to reduced imports of coal and oil, consumption of firewood and charcoal has gone up from 3 million tons and 700,000 tons respectively in 1939 to 9 million tons and 1 million tons in 1945. The greatest part of this increase is in the railways' consumption of firewood, which has gone up from half a million to 4½ million tons (**11**; April 1946).

Australia. An experiment was recently made in the utilization of Bull Oak (*Casuarina luehmanni*) as a flooring timber. The timber is hard and heavy (7 lb./cu. ft.) with an attractive figure and colour. Seasoning and milling were carried out without difficulty, but it was found that there were so many knot holes, leading to the rejection of about 65 per cent. of the material, that it was not considered practicable to utilize this species (**17**; April 1946).

An Adelaide firm is making 80,000 tobacco pipes annually from Australian hardwoods (Mallee, Red Gum, Sheoak, and Sandalwood), which are very suitable for the purpose and in some respects (e.g. capacity for absorbing moisture, and for not generating heat in the mouth) superior to imported briars. Removal of tannin, and electrical seasoning to prevent cracking, are necessary. Electrical seasoning takes about two months (**2**; Feb. 1947).

Red Gum [*Eucalyptus rostrata*] is one of the most valuable Australian timbers owing to its resistance to attack by white ants. The extensive forests of this species along the Murray River are threatened with destruction unless they can be flooded this year. Before the recent construction of the Hume weir they were flooded almost every year (**2**; Feb. 1947).

Belgium. A research laboratory for the purpose of studying the timbers of the Belgian Congo is about to be set up by the Comptoir de Vente des Bois Congolais (233 Rue de la Loi, Brussels). Particular attention will be devoted to the problem of attacks on Limba [*Terminalia superba*] by *Lyctus brunneus* and *Minthea rugicollis* (**4**; March 1947).

The spread of canker on Poplars in Lower Belgium has reached a point at which it threatens the cultivation of Poplars altogether. The Minister of Agriculture has accordingly made an order that any Poplar showing symptoms of canker must be reported by the owner to the local forest officer, together with its girth at breast height, before the 1st of July in each year. The owner will be instructed whether and when to fell the tree, and if he does not do so within the time specified, the tree will be felled by the Forest Department at his expense, without prejudice to any possible legal penalties. The forest officers have also been instructed to look out for diseased trees and inform the owners, without waiting for the latter to take the initiative (**1**; Feb. 1947).

British Honduras. In 1898-9 an Indian landowner attempted to establish Mahogany (*Swietenia macrophylla*) in natural forest on his own land by artificial sowing and planting. The estate was inspected in August, 1946. All attempts to plant in regular rows on cleared land failed. All attempts to grow Mahogany in relatively dense stands, and subsequently (i.e. when from 5 to 10 years old) to cut out the other species and convert it to a pure stand of Mahogany also failed, the Mahogany dying out completely within two years of the completion of the operation. The only successful trees were those raised from seed planted at random in the natural bush and receiving no attention beyond periodical removal of actually strangling lianes, etc. (**8**; 1946).

Canada. New forestry legislation is now being drafted for presentation to the British Columbia legislature next session, in accordance with the recommendation of the Sloan Commission. It is reliably reported that the new policy will include provisions to ensure reforestation of cut-over lands, regulation of logging methods to prevent destructive exploitation, and revision of taxation and tenure systems to encourage private forestry (**19**; Jan. 1947).

China. A striking example of conservation has recently come to light in the discovery by H. H Hu of three living Sequoia-like trees near a temple in central China. Certain marked differences distinguish them from American Redwoods, but their close relationship is at once apparent. The fossil remains of this new tree, *Metasequoia*, have long been known in North America, Europe and Asia (**22**; March-April 1947).

Colonial Empire. Headquarters of the Directorate of Colonial Surveys have been set up at Bushey Park, Teddington, where all computations and the plotting and drawing of maps will be done. An agreement has been reached with the Air Ministry, whereby the R.A.F. will photograph some 50,000 sq. miles a year for the Directorate. The 1946 programme was entirely in West Africa and consisted of a total of 145,000 sq. miles. This area, though much in excess of the agreed annual programme, was well within the capacity of the photographic expedition sent to West Africa. The 1947-48 programme provides for the photography of 120,000 sq. miles of first priority with additional areas of lower priority, covering all the East African Territories, including Aden and British Somaliland and the High Commissioner's territories in South Africa. While waiting for the results of the West African photography, the drawing staff have been engaged in plotting maps of Jamaica and other West Indian islands from American photographs taken during the war (**8**; 1946).

Denmark. Of the 11 paper mills in Denmark, 6 represent the bulk of the country's present total capacity of about 82,000 metric tons annually. Production during 1945 was about 80 per cent. of capacity, chiefly because of difficulties encountered in getting raw material. Chemical-pulp imports generally amount to about 60,000 metric tons annually and mechanical pulp about 25,000 tons. Present demands for paper in Denmark far exceed what the domestic industry can supply (**9**; 11.1.47).

France. It has been decided to create an Institute of Colonial Forest Research, organized on the model of the Forest Products Laboratories at Madison and Princes Risborough. The Institute, which will be located at Nogent-sur-Marne, will collect and circulate world literature, as well as the results of research, in the laboratories and at colonial experiment stations which will pursue those

researches which must be carried out in tropical conditions. It is also proposed to put in hand a long-term programme for the development of forest industries in the French colonies in tropical Africa (**15**; Jan. 1947).

Germany. Details of the Harz project, the clear-felling of about 13,000 acres of Spruce in the southern districts of Hanover, are now published. The scheme covers an area which contains over 3 million tons of millable Spruce over 80 years old, most of which is being shipped to Great Britain. It has emerged from the work already done that the German rotation system of 120 years is 20 years too long. The operation has already demonstrated that much good timber is invariably spoilt by butt rot after 100 years of growth, and the Germans have been quick to learn the lesson and have now adopted a rotation of 100 years (**18**; Feb. 1947).

Great Britain. The Forest of Ae, about 10 miles north of Dumfries, is a State forest which the Forestry Commission began to plant in 1927. Planting continues, and in order to make provision for the increasing number of workers required the Commission have undertaken the creation of an entirely new forest village, including school, church, village hall and inn. This is the first of several similar forest villages in different parts of Scotland (**21**; 26.4.47).

The Forestry Commission draws attention to the risk of an epidemic in young Spruce forests, resulting from the introduction of beetles in unbarked Spruce logs from Germany, and timber merchants are urged to bark any unbarked or partially barked logs and burn the bark. Examination of the first consignment of German Spruce imported into Great Britain last year showed that many logs carried in the bark large numbers of eggs, larvae and adults of *Ips typographus*, which has not so far established itself in this country. There are other bark beetles coming in with German Spruce which are almost equally unwelcome, as well as a number of sapwood borers including the very destructive house longhorn beetle [*Hylotrupes bajulus*] which usually harbours in Pine logs. (**21**; 12.4.47).

Use of thermostatic control on glue pots in one factory saves a minimum of 72 hours' working time weekly. The factory, which is engaged on cabinet assembly work, has thermostatically controlled, electrically operated glue pots at each of 12 working assembly benches. A time control on the switchboard panel sets the thermostats in operation at 7 o'clock each morning, and when the staff arrives at 8 a.m. the glue is ready for work. Normally glue-boiling may result in an hour's wasted time per man, which gives a minimum of 12 hours daily (**19**; Jan. 1947).

Guadeloupe. An order of 24 October, 1946, forbids the use of wood and of charcoal in industrial establishments, with the exception of Mangrove wood which may be cut under the supervision of the Forest Service. This is a first step in the direction of effective regulation of exploitation and reforestation. The island has suffered much in the past from unregulated and excessive exploitation of the forests (**15**; Jan. 1947).

Guatemala. A reforestation project has been started recently in the Department of Solola, Guatemala, under the direction of the Forest Section of the Guatemalan Ministry of Agriculture. Local authorities and land owners have co-operated in the planting of 200,000 trees on the catchment above the town of Panajachel in the region of Lake Atitlan (**9**; 11.1.47).

Hungary. During 1946 a law was passed and put into force in Hungary, nationalizing all but the smallest forest properties, and 75 per cent. of all forests are now owned by the State and administered by a newly formed department (known as Mallerd). A recent forest appraisal carried out by this Department estimates the volume of standing timber in all forests at 60 million cu.m. The estimated cut for 1946-47 is 3 million cu.m., which would leave the need for at least 1 million cu.m. of hardwood imports in order to meet the requirements of the lumber-working industries. The Hungarian authorities are preparing plans for further afforestation. All areas not needed for agriculture are to be planted, and special attention will be given to Poplar for plywood (**20**; 19.4.47).

There are at present 103 privately owned sawmills and 56 state-owned sawmills with a total of 250 frame saws, the greater number of which are old-fashioned and of low capacity. Shortage of logs is making it difficult for the mills to keep working at all (**6**; 1.4.47).

Italy. It is proposed to set up a centre for research on oleoresins under the auspices of the national research council and the University of Florence, and under the directorship of Prof. F. C. Palazzo of the Institute of Agricultural and Forest Chemistry (**10**; March-April 1947).

Kenya. There are plans for greatly increasing the production of Wattle bark and extract. In the Kikuyu area, where bark of excellent quality has been produced by Africans, the plantations are to be extended. Free advice will be given by technical experts, and there will be guaranteed prices to producers of bark for 15 years (**7**; Jan. 1947).

Manchuria. The removal, by Russian troops, of locomotives, wagons and rails installed by the Japanese for the exploitation of the forests of Manchuria has paralysed the timber industry in that region. The Japanese had laid down 1,676 km. of railway line and imported 264 German locomotives and 1,024 wagons (**15**; Jan. 1947).

Mexico. A new pulp mill at Atenquique in the state of Jalisco will use about 200 cords of wood daily from timberlands within a radius of 60 miles. The principal species available are *Pinus ayacahuite*, *P. leiophylla*, *P. teocote*, *P. montezumae*, *P. lumholtzii*, and *Abies religiosa* (**13**; Oct. 1946).

New Zealand. The Royal New Zealand Air Force last month [October] began operating a fire patrol flight in the Rotorua area, where there are large exotic plantations. The operation is seasonal, carried out in co-operation with the State Forest Service during the months when fire danger is most acute, and it will continue until April. The flight has to be constantly on call for observing and locating fire and it will also carry out communication flights for State Forestry officials (**2**; Nov. 1946).

Nigeria. The Department of Commerce and Industries has announced that the United Africa Co. is creating a £500,000 factory at Sapele, on the Benin River, for the manufacture of plywood. The plant will handle the whole processing of plywood from the trimming of logs to the export of dried plywood boards, and its output will be about 3,000 tons a year. It is expected that the mill will be ready to export veneer early in 1947, and will reach full operation by the middle of the year (**7**; Oct. 1946).

Norway. The felling programme seems to be progressing satisfactorily and by 15 February about 70 per cent. of the target of 6 million cu.m. for the year had already been felled. It is hoped to increase the total to 7 million, of which at least 3 million will be converted into timber, most of which will probably be absorbed by the domestic building industry (**20**; 29.3.47).

Poland. The official estimate of timber production for 1947 is 8 million cu.m., the greater part of which will be obtained from the recovered territories, which have been less subject to over-exploitation than the forest of the old territories. It is estimated that there are in Poland one million ha of cut-over forest land which are not regenerating, and another million ha. of waste land which could be profitably afforested. The forestry programme for 1947 makes provision for the reforestation of 50,000 ha. following normal fellings and of 30,000 ha. felled during the war or waste land. Priority will be given to mountain slopes, where the risk of erosion is greatest (**15**; Jan. 1947).

Sierra Leone. A small sawmill at Wellington, near Freetown, produces about 5,000 tons of Mangrove fuel billets annually. In addition to providing excellent fuel (most of which goes to the railway) this clears ground for agricultural development in Mangrove swamps (**6**; Oct. 1946).

Local Hendui (*Lophira procera*) has been found to be superior to South African Blue Gum and almost equal to British Guiana Greenheart for its teredo-resistant properties. (**7**; Dec. 1946).

South Africa. In 1914 the Forestry Department imported some Pine seed from a French firm, which was planted in the Transvaal and Natal and produced trees of exceptional growth with high-quality wood which is excellent for factory use and pattern making. It has been tentatively identified as the Mexican species known at Teocote (*Pinus pseudostrobus* var. *tenuifolia*). Seed imported from British Honduras has produced Slash Pine (*P. caribaea*) very much superior to that grown from seed of U.S. origin which now covers 25 per cent. of the timber-growing area in the South African summer rainfall belt. A research officer of the Forestry Department has been sent to Mexico and British Honduras to try to identify the two species for certain and to arrange if possible for an annual supply of seed to South Africa, where they are much needed on account of their high quality and rapid growth (100 ft. high and 18-in. trunk in 30 years) (**20**; 26.4.47).

Sweden. Some shortage of fuelwood has occurred even in typical production forest regions such as northern Ångermanland and north-western Jämtland, one of the causes being the ever-ancreasing interest of the pulp industry in hardwoods, particularly Birch and Aspen, which now command prices such that cutting for fuelwood can scarcely compete. The Mo and Domsjö Company is using Aspen at its sulphite, and Birch at its sulphate mill (**16**; 15.4.47).

The Wood Research Institute in Stockholm is obtaining promising results in its investigation of lignin. By exposing the wood cells to ultra-violet rays, research workers have localized the situation of the lignin in the cells and have partially succeeded in revealing its chemical structure (**9**; 1.3.47).

Switzerland. The forest area of Switzerland in 1940 was 3,794 sq. miles, or 24 per cent. of the area of the entire country and 31 per cent. of the productive land. Annual production was normally about 3 million cu.m., but this was insufficient for the country's requirements, and considerable amounts, particularly of hardwoods, were imported. From 1939 to 1943 the average annual cut amounted to more than 40 million cu.m. It is generally admitted that this represents over-cutting and must be reduced, but at the same time there is a heavy demand for timber, particularly for building The impossibility of obtaining imports of coal has also led to very heavy demands for fuelwood, and the production of firewood in 1945 was 5 million cu.m., or 3 times the pre-war annual production (**9**; 1.2.47).

U.N.O. The Forestry staff so far appointed to F.A.O. is headed by M. Marcel Leloup, who has considerable experience both in African and in Metropolitan France; he left the senior post in the French Forest Service to take charge of the Forestry and Forest Products division of F.A.O. He is assisted by Dr. Egon Glesinger, who has long experience in international forestry and is responsible for Forest Products, and by Mr. D. Show, lately Regional Forester for the West Region of the U.S. Forest Service, responsible for Forestry. Mr. J. D. B. Harrison has left the post of Forest Economist to the Canadian Dominion Government to take charge of the Economics section under Mr. Show. Further appointments are under consideration.

F.A.O. has already taken over the International Institute of Agriculture at Rome with its Forestry Section, and the Centre International de Silviculture at Berlin. The C.I.S. Library is being collected at Salzburg in the charge of an officer of F.A.O. The Copenhagen conference considered what steps might be taken with regard to the Comité International du Bois, which has lost all its few assets but has rather large debts. While the Forestry Committee recommended that F.A.O. should take it over, liabilities and all, and restore its statistical service at an early date, the Conference was not willing to do this and the matter is believed to be still *sub judice*. The future relationship of the International Union of Forest Experiment Stations to F.A.O. was referred to an expert committee for examination and report.

The general wish for the early restoration of pre-war contacts and co-operation in forestry in Europe led to a strong recommendation that a European regional office should be set up as soon as possible. If it is decided to do this for F.A.O. as a whole, the Forestry office would be at the same place, but the Forestry Committee was of opinion that their need was urgent and should be provided for independently if a decision for the other divisions were delayed. The final recommendation of the Committee was that a third World Forestry Congress should be held in 1948 (**8**; 1946).

United States. The Forest Products Research Society, a national association devoted entirely to stimulating wood research, development, utilization and production, has been founded as a result of a meeting held at Madison, Wisconsin, of industrial, educational, and government technologists. The society will consist of six regional sections, including those parts of Canada adjacent to the United States. The address of the Secretary-Treasurer of the Society is P.O. Box 2088, University Station, Madison 5, Wisconsin (**13**; Feb. 1947).

A process for converting sulphite waste liquor into lactic acid has been developed at the University of Wisconsin. About 285 lb. of lactic acid and 75 lb. of acetic acid can be made from 2,000 gallons of sulphite waste (the amount obtained from a ton of Spruce wood pulp). More work remains to be done on means of recovering the acid (**13**; March 1947).

The White River Lumber Co. of Enumclaw, Washington, has adapted three railway tank wagons for fire fighting. They are standard 8,000 gal. tank wagons, equipped with two or three hose reels (each with a capacity of 800 ft. of $1\frac{1}{2}$-inch hose) and fire pump. They can be moved quickly by the company's locomotives and used on the 100 miles of logging railway maintained. The railway formations are a quick means of reaching any portion of the 67,000 acres of the company's land and are kept in good condition for that reason (**21**; Dec. 1946).

Logs that were sunk in Michigan rivers in drives of 50 to 60 years ago are now being brought out by winches and taken to the sawmills. These logs, mainly of Hemlock, Elm, Maple, Basswood and Oak, are perfectly preserved, and the log marks indicating original ownership are plainly visible (**5**; April 1947).

U.S.S.R. The Academy of Sciences of the U.S.S.R. in 1944 sent an expedition to explore the fruit and nut resources of an area of some 50,000 ha. in southern Kirghiz, in the mountains between Ferghana and Chetkal. The vast forests of Walnut, Apple and Wild Plum [? *Prunus divaricata*] would provide almost inexhaustible raw materials for fruit preserving and vitamin manufacture, and plans are in hand for state farms and factories for treating the fruit and extracting vitamins from the green walnuts. It has now been found that Vitamin C can be equally well extracted from the Walnut leaves, so that the nuts can be left to ripen and provide material for the extraction of oil and proteins.

A striking aspect of the region is the great variety of biological forms to be found there; the number of Walnuts recorded by the expedition was about 80, of Apples nearly 100, and of Wild Plum about 60. Although growing wild, they have a very good flavour and are of great nutritive value. The wild walnuts, for example, contain more oil than the best varieties cultivated in Russia or France, some varieties containing as much as 75 per cent. compared with a maximum of 65 per cent. for cultivated species [cf. *For. Abstr.* 8 (No. 994)] (**14**; Dec. 1945).

Part of the five-year plan of the Ukrainian Academy of Science is the laying out of a 500-acre Botanical Garden near Kiev, which will serve as a kind of laboratory for the introduction of new fruit trees, industrial crops, and medicinal herbs. The garden will be divided into geographical zones (**3**; March 1947).

Pravda has sharply criticized workers and administrators in the Russian timber industry. It complained that output per man was only 80 per cent. of what it should be; production was far behind the planned figure; only one-third of the 6,000 available electric saws were being used; of 3,300 tractors supplied to the industry, only 400 were working in the period from October to December, the rest were under repair (**20**; 15.2.47).